METROPOLITAN
TRANSPORTATION
COMMISSION

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BAY BRIDGE DESIGN TASK FORCE
Wednesday, April 8, 1998
1 p.m.
Joseph P. Bort MetroCenter Auditorium
101 Eighth Street
Oakland, California 94607

Chairperson: Mary King
Members: Sharon Brown
Mark DeSaulnier
Elihu Harris
Tom Hsieh
Jon Rubin
Angelo Siracusa
Staff Liaison: Steve Heminger

FINAL AGENDA

1. Welcome and introductions - Mary King, Chair

2. Report on design alternatives for new Bay Bridge eastern span - Brian Maroney and Denis Mulligan, Caltrans*

3. Legislative update - Steve Heminger, MTC*

4. Report on process of naming bridges - Steve Heminger, MTC*

5. Report on contracting opportunities in toll bridge construction - Denis Mulligan, Caltrans

6. Other Business/Public Comment

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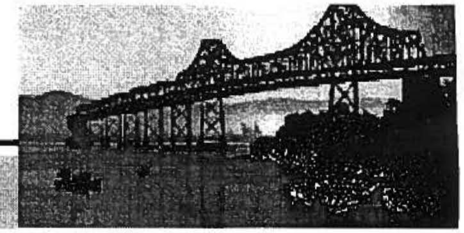
* Attachment sent to members, key staff, and others as appropriate. Copies available at meeting.

Public Comment: The public is encouraged to comment on agenda items at committee meetings by completing a request-to-speak card (available from staff) and passing it to the committee secretary or chairperson. Public comment may be limited by any of the procedures set forth in Section 3.09 of MTC's Procedures Manual (Resolution No. 1058, Revised) if, in the chair's judgment, it is necessary to maintain the orderly flow of business.
Record of Meeting: MTC meetings are tape recorded. Copies of recordings are available at nominal charge, or recordings may be listened to at MTC offices by appointment.
Sign Language Interpreter or Reader: If requested three (3) working days in advance, sign language interpreter or reader will be provided; for information on getting written materials in alternate formats call 510/464-7787.
Transit Access to MTC: BART to Lake Merritt Station. AC Transit buses: #11 from Piedmont or Montclair; #59A from Montclair; #62 from East or West Oakland; #35X from Alameda; #36X from Hayward.
Parking at MTC: Metered parking is available on the street. No public parking is provided.

New East Bay Segment of the San Francisco-Oakland Bay Bridge - 59A0040



Organization Chart, Phase I

Caltrans District 59

Contract Manager
Ade Akinsanyna, P.E.

Project Manager
Brian Maroney, Ph.D., P.E.

Project Administrator
Mark Swatta, P.E.

Project Manager
Allen Ely, P.E.

Bridge Design Manager
Rafael Manzanarez, P.E.

Technical Supervisors
Man-Chung Tang, P.E.
Joseph Penzien, P.E.
Chuck Seim, P.E.
Greg Fenves, P.E.
Helmuth Krawinkler, P.E.

SUSPENSION BRIDGE
Herbert Rothman, S.E.
Team Project Engineer

SUSPENSION & SKYWAY BRIDGE
Donald MacDonald
Bridge Architect
Howard Brandston
Lighting Designer

CABLE-STAYED BRIDGE
David Goodyear, S.E.
Team Project Engineer

CABLE-STAYED & SKYWAY BRIDGE
Thomas Piotrowski
Bridge Architect
David Mintz
Lighting Designer

SKYWAY BRIDGE
Karen Cormier, P.E.
Team Project Engineer

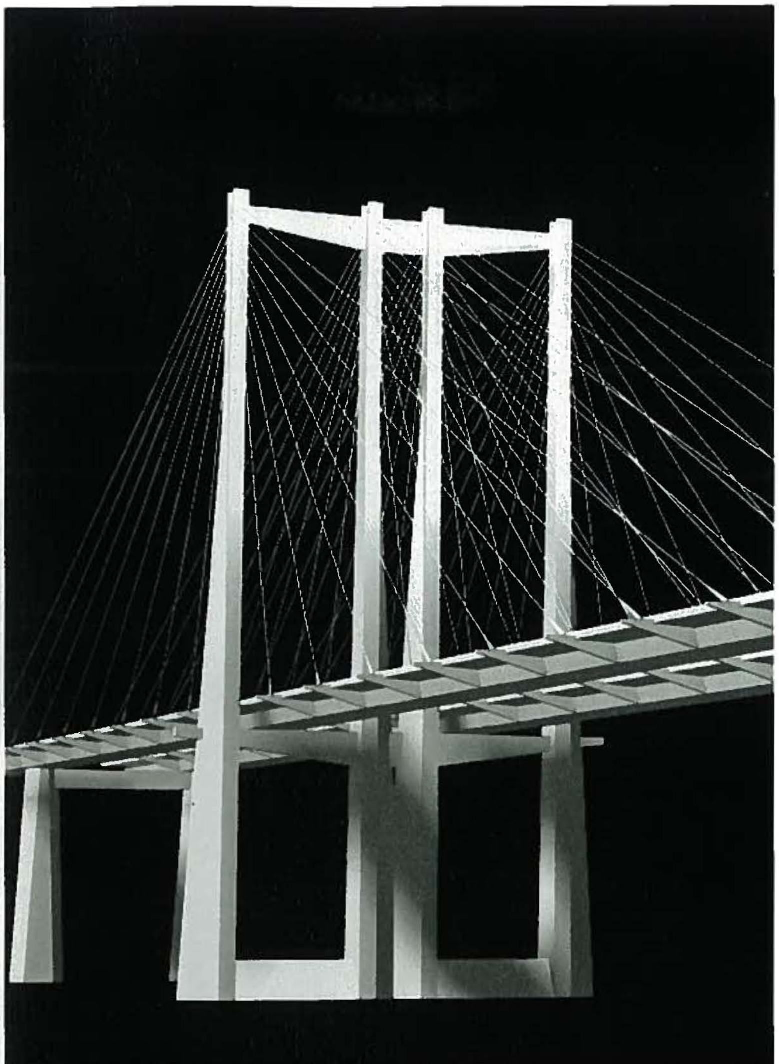
ANALYSIS SUPPORT
Tim Ingham, S.E.
Team Project Engineer

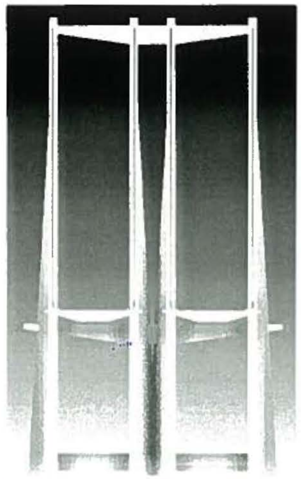
ANCILLARY STRUCTURES
Jal Birdy, P.E.
Team Project Engineer

DESIGN SUPPORT TEAM
Kim Prishtina, P.E.
Project Engineer

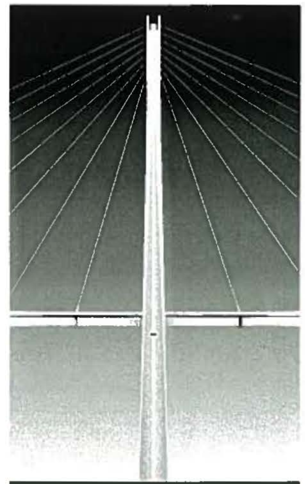
Agenda Item 2

T.Y. LIN INTERNATIONAL
MOFFATT & NICHOL ENGINEERS
a joint venture

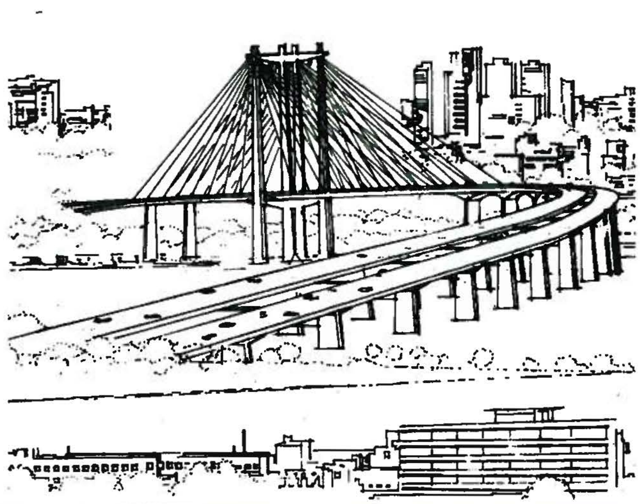




TRANSVERSE ELEV.



LONGITUDINAL ELEV.



NEW EAST BAY SEGMENT OF THE SAN FRANCISCO OAKLAND BAY BRIDGE

Cable Arrangement: Semi-fan.

No. of cables: 8 on each of two sides, 4 vertical planes

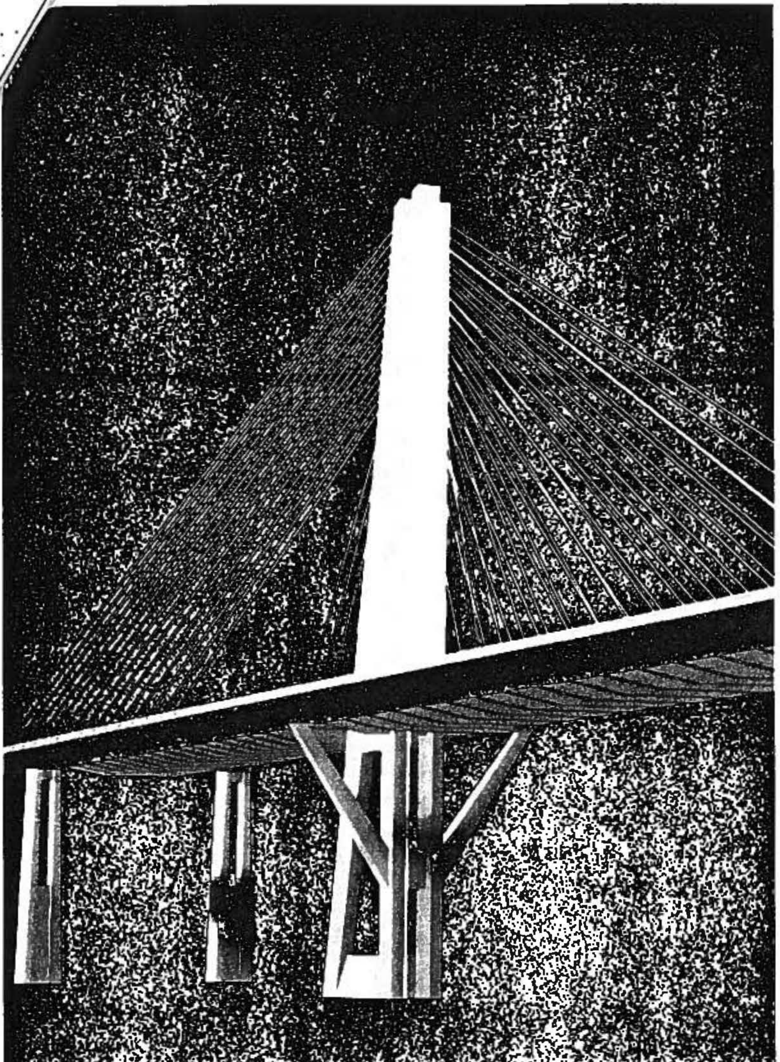
Scheme A is a twin tower option with cross bracing at the top of the towers and below the deck.

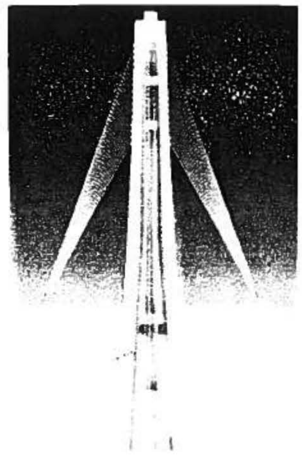
Scheme A is a traditional twin tower scheme. The form of the towers evokes images of the west span and the Golden Gate.

It is comprised of twin two-legged towers merging into a three-legged form at the base. The scheme exhibits a double symmtery with four vertical planes of cable. The twin towers are joined by cross beams at the top of the tower and below the decks which serve to unify the composition if the design.

SCHEME A

Caltrans





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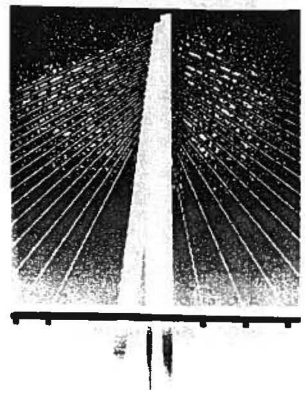

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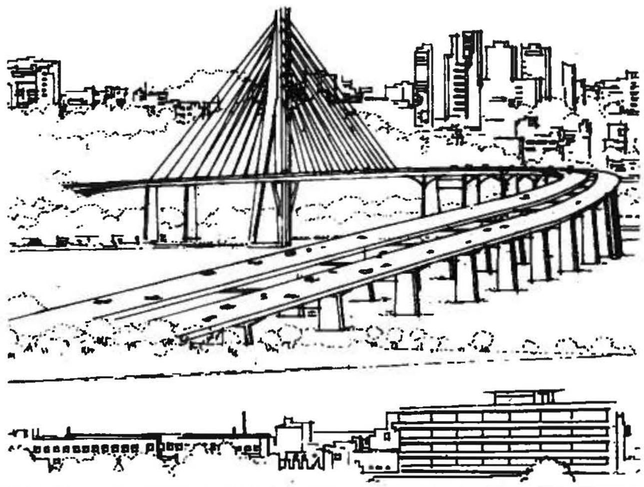


NEW EAST BAY SEGMENT OF THE SAN FRANCISCO OAKLAND BAY BRIDGE

Cable Arrangement: Semi-fan

No. of cables: 16 cables to the inside of each deck on the front span 16 cables to the outside of each deck for rear span.

This scheme has a shiplike quality, evoking a vessel with sail.

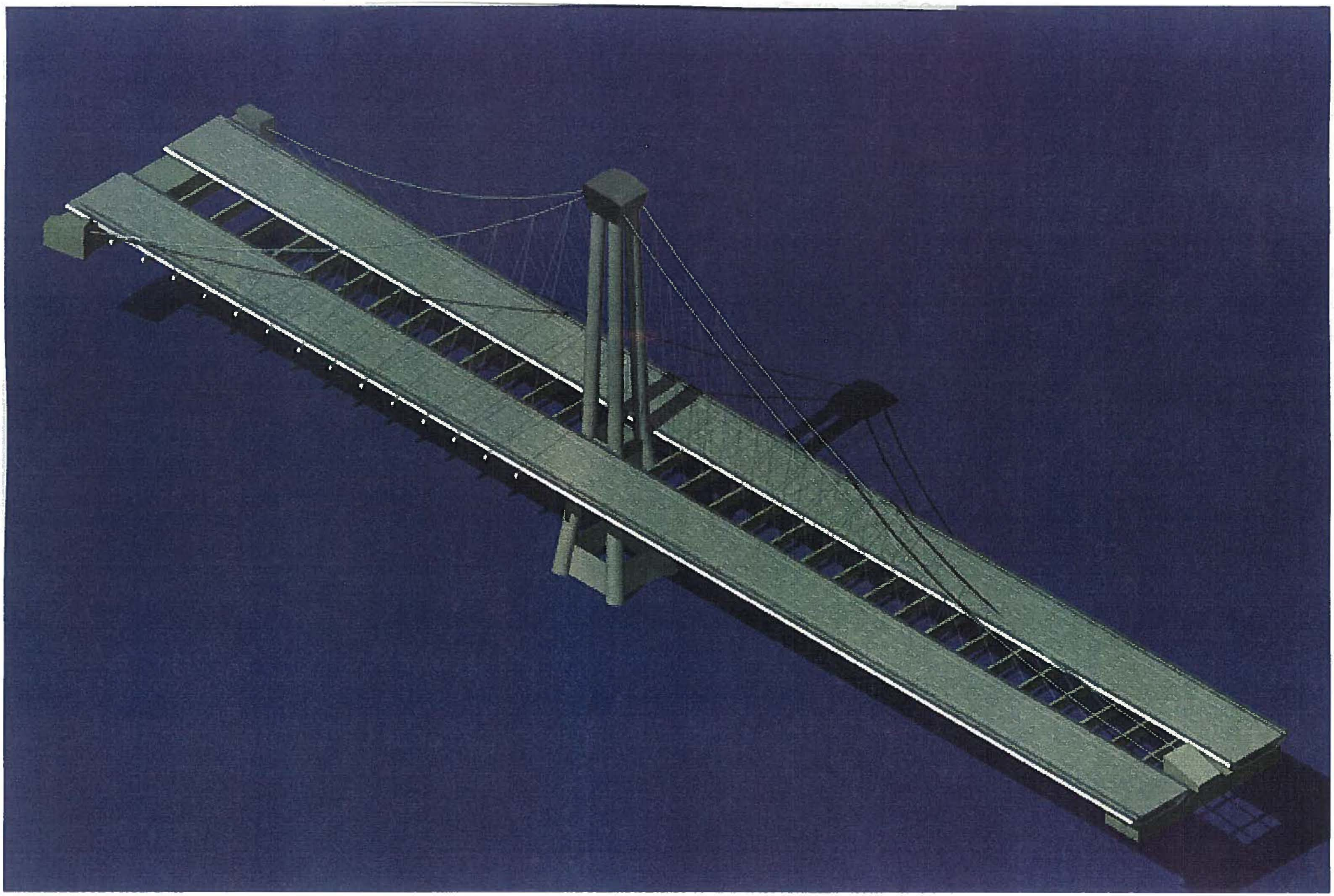
It is comprised of a single pylon on four (4) feet, with an asymmetrical cable arrangement (two inside planes of cable at front span, two outside planes of cable at back span). This asymmetry reinforces the different end conditions: land/tunnel vs. open bay.

The single pylon contains an illuminated shaft which serves as a beacon in the landscape.

SCHEME B

Caltrans

Self-anchored Suspension Span, Single Tower



Self-anchored Suspension Span, Double Portal

Public Responses To Proposed Bay Bridge Designs
(Tally From March 16 - 31, 1998)

Design Type	Phone	E-mail	Letters	Total
Cable-Stayed				
Single Tower	87	66	1	**154**
Double Portal	42	24	3	**69**
Suspension				
Single Tower	18	19	3	**40**
Double Portal	86	82	5	**173**
TOTAL COMMENTS				**436**

- A number of responses expressed opinions, but no preferences. Comments ranged from opposition to all of the current designs to stating that the only considerations should be cost and structural stability. There were also a few votes just for single or double tower.

- There were 11 comments in favor of including a bike/pedestrian path on the new bridge.

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Memorandum

TO: Bay Bridge Design Task Force

DATE: March 27, 1998

FR: Steve Heminger

RE: Legislative Update

Three bills have been introduced in the 1998 session of the State Legislature that have some bearing on the work of the Bay Bridge Design Task Force. They are briefly summarized below for your information.

- AB 1846 (Perata) would prohibit Caltrans from using toll revenues or State Highway Account funds to demolish the ramps connecting the Transbay Transit Terminal in San Francisco to the Bay Bridge. The bill is set for hearing in the Assembly Transportation Committee on March 30. Caltrans' preferred retrofit design for the Transbay Terminal ramps is to demolish the east ramp and to retrofit the west ramp and convert it to two-way bus operations for AC Transit. MTC has retained a traffic engineering consultant to examine the impact of Caltrans' ramp proposal on AC Transit operations and bus storage. The Task Force will receive a report on this consultant study at your next meeting.

- AB 2038 (Migden) would add a fourth item to the list of eligible "amenities" on the new Bay Bridge for which MTC can extend the $1 seismic retrofit toll surcharge for up to two years: bicycle and pedestrian access on the existing west span of the Bay Bridge. Under current law, there are three eligible amenities for the toll surcharge extension: a cable-supported new eastern span, relocation or replacement of the Transbay Terminal, and bicycle/pedestrian access on the new eastern span. AB 2038 also is set for hearing in the Assembly Transportation Committee on March 30.

- SB 1684 (Rainey) would set forth legislative findings relating to seismic retrofit and the contracting out of seismic retrofit projects, and would urge Caltrans and the Business, Transportation and Housing Agency to continue to expedite the delivery of seismic retrofit projects with the use of private consultants. SB 1684 is set for hearing in the Senate Transportation Committee on April 21.

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Memorandum

TO: Bay Bridge Design Task Force

DATE: March 27, 1998

FR: Steve Heminger

RE: Report on process of naming bridges

In connection with the new eastern span of the San Francisco-Oakland Bay Bridge, Chairperson Mary King asked for a report on how bridges are named in California.

Highways and bridges in the state are named either through general usage or by legislative action. The San Francisco-Oakland Bay Bridge is generally known as the Bay Bridge. Some time ago, there was an attempt to name the bridge after James "Sunny Jim" Rolph, a former mayor of San Francisco and Governor of California who died in office as governor in 1934. However, the naming of the bridge after Rolph was never made official by act of the Legislature.

To secure approval by the Legislature, an Assembly or Senate concurrent resolution must be approved by both houses. The signature of the Governor is not required. Thereafter, Caltrans policy requires the sponsors of the bridge or highway naming to raise private funds for at least two roadside signs, one in each traffic direction. According to Caltrans, the cost for the two signs ranges from $800 to $1,200, depending on the length of the name inscribed on the signs.

1998

PROJECT	CRAFT HOURS: Ironworker	Pile Driver	Op. Engr	Laborer	Carpenter	Conc. Finisher/ Cement Mason	Mech/Electr	PROJECT TOTALS
SFOBB Replacement	0	0	0	0	0	0	0	0
SFOBB West Span Retrofits	Structural: 159,917 Rebar: 3,276	0	20,151	4,694	4,714	1,571		194,323
Carquinez (East Bridge) Retrofit	Structural: 72,275 Rebar: 6,720	12,640	24,028	13,130	7,320	800	990	137,903
Carquinez West Replacement	Structural: 0 Rebar: 0	0	0	0	0			0
Carquinez, other: Crockett I/C Approach Span, New Maint. Station, Roadway Work	0	0	0	0	0	0	0	0
San Mateo-Hayward Widening	Structural: 0 Rebar: 0	0	0	0	0	0	0	0
Benicia-Martinez Replacement (Abutment to Abutment)	0	0	0	0	0	0	0	0
Benicia-Martinez Retrofit	110,160	104,040	216,240	2,040	26,520	108,120		567,120
Richmond-San Rafael Retrofit (EAs 043821, 043841)	0	0	0	0	0	0	0	0
CRAFT TOTALS	82,211	116,680	260,419	19,864	38,554	110,491	990	899,346

1999

PROJECT	CRAFT HOURS							PROJECT TOTALS
	Ironworker	Pile Driver	Op. Engr	Laborer	Carpenter	Conc. Finisher/ Cement Mason	Mech/Electr	
SFOBB Replacement	0	0	0	0	0	0	0	
SFOBB West Span Retrofits	Structural: 319,834 Rebar: 21,295	675	40,303	30,513	30,638	10,213		453,471
Carquinez (East Bridge) Retrofit	Structural: 92,925 Rebar: 15,120	15,800	24,028	29,543	16,470	1,800	2,228	197,914
Carquinez West Replacement	Structural: 0 Rebar: 30,600	61,200	16,320	14,280	10,200			132,600
Carquinez, other: Crockett I/C Approach Span, New Maint. Station, Roadway Work	10,200	48,960	22,440	71,400	10,200	4,080	4,080	171,360
San Mateo-Hayward Widening	Structural: 21,643 Rebar: 19,768	15,321	23,293	26,013	29,651	9,884		145,573
Benicia-Martinez Replacement ~Abutment to Abutment)	80,000	25,000	25,000	123,000	140,000	17,000	1,500	411,500
Benicia-Martinez Retrofit	93,840	89,760	181,560	2,040	120,360	95,880		583,440
Richmond-San Rafael Retrofit (EAs 043821, 043841)	106,000	30,000	36,000	178,000	100,000	81,000	15,000	546,000
CRAFT TOTALS	362,051	286,716	368,944	474,789	457,519	219,857	22,808	2,641,858

2000

PROJECT	CRAFT HOURS: Ironworker	Pile Driver	Op. Engr	Laborer	Carpenter	Conc. Finisher/ Cement Mason	Mech/Electr	PROJECT TOTALS
SFOBB Replacement	[illegible]	389,640	505,920	140,760	346,800	234,600	193,800	2,207,280
SFOBB West Span Retrofit	[illegible]	[illegible]	40,303	46,943	47,136	15,712		556,671
Carquinez (East Bridge) Retrofit	Structural: [illegible] Rebar: [illegible]	3,160	20,595	22,977	12,810	1,400	1,732	115,734 DONE
Carquinez West Replacement	Structural: 0 Rebar: 44,880	75,480	10,200	24,480	16,320			171,360
Carquinez, other: Crockett I/C Approach Span, New Maint. Station, Roadway Work	14,280	40,800	22,440	77,520	10,200	4,080	4,080	173,400
San Mateo-Hayward Widening	Structural: 27,826 Rebar: 44,477	19,151	23,293	58,530	66,716	22,239		262,232
Benicia-Martinez Replacement (Abutment to Abutment)	70,000	23,000	25,000	123,000	100,000	25,000	1,500	367,500
Benicia-Martinez Retrofit	89,760	85,680	173,400	2,040	116,280	69,360		536,520
Richmond-San Rafael Retrofit (EAs 043821, 043841)	106,000	45,000	36,000	178,000	100,000	81,000	15,000	561,000
CRAFT TOTALS	792,983	682,586	857,151	674,250	816,262	453,391	216,112	4,951,697

2001

PROJECT	CRAFT HOURS							PROJECT TOTALS
	Ironworker	Pile Driver	Op. Engr	Laborer	Carpenter	Conc. Finisher/ Cement Mason	Mech/Electr	
SFOBB Replacement	395,760	389,640	505,920	140,760	346,800	234,600	193,800	2,207,280
SFOBB West Span Retrofits	Structural: 181,239 Rebar: 32,762	5,398	40,303	46,943	47,136	15,712		369,493
Carquinez (East Bridge) Retrofit	Structural: Rebar:							
Carquinez West Replacement	Structural: 32,640 Rebar: 0	0	18,360	12,240	0			63,240
Carquinez, other: Crockett I/C Approach Span, New Maint. Station, Roadway Work	42,840	30,600	28,560	91,800	38,760	4,080	8,160	244,800
San Mateo-Hayward Widening	Structural: 12,367 Rebar: 34,593	3,830	19,965	45,524	51,890	17,297		185,466 DONE
Benicia-Martinez Replacement (Abutment to Abutment)	70,000	14,000	24,000	124,000	100,000	20,000	2,000	354,000 DONE
Benicia-Martinez Retrofit	22,440	12,240	4,080	0	28,560	18,360		85,680 DONE
Richmond-San Rafael Retrofit (EAs 043821, 043841)	107,000	15,000	37,000	178,000	100,000	80,000	16,000	533,000 DONE
CRAFT TOTALS	717,640	470,708	678,188	639,267	713,146	390,049	219,960	4,042,959

2002

PROJECT	Ironworker	Pile Driver	Op. Engr	Laborer	Carpenter	Conc. Finisher/ Cement Mason	Mech/Electr	PROJECT TOTALS
	CRAFT HOURS							
SFOBB Replacement	250,920	236,640	479,400	0	326,400	193,800	0	1,487,160
SFOBB West Span Retrofits	Structural: 21,322 Rebar: 40,952	5,398	30,227	58,679	58,920	19,640		235,138
Carquinez (East Bridge) Retrofit	Structural: Rebar:							
Carquinez West Replacement	Structural: 46,920 Rebar: 0	0	10,200	0	0			57,120 DONE
Carquinez, other: Crockett I/C Approach Span, New Maint. Station, Roadway Work	30,600	0	24,480	83,640	36,720	0	8,160	183,600 DONE
San Mateo-Hayward Widening	Structural: Rebar:							
Benicia-Martinez Replacement (Abutment to Abutment)								
Benicia-Martinez Retrofit								
Richmond-San Rafael Retrofit (EAs 043821, 043841)								
CRAFT TOTALS	328,440	242,038	544,307	142,319	422,040	213,440	8,160	1,963,018

2003

PROJECT	CRAFT HOURS: Ironworker	Pile Driver	Op. Engr	Laborer	Carpenter	Conc. Finisher/ Cement Mason	Mech/Electr	PROJECT TOTALS
SFOBB Replacement	[illegible]	28,560	20,400	0	0	0	0	114,240
SFOBB West Span Retrofit	[illegible]	1,349	30,227	46,943	47,136	15,712		184,790 DONE
Carquinez (East Bridge) Retrofit	Structural: Rebar:							
Carquinez West Replacement	Structural: Rebar:							
Carquinez, other: Crockett I/C Approach Span, New Maint. Station, Roadway Work								
San Mateo–Hayward Widening	Structural: Rebar:							
Benicia–Martinez Replacement (Abutment to Abutment)								
Benicia–Martinez Retrofit								
Richmond–San Rafael Retrofit (EAs 043821, 043841)								
CRAFT TOTALS	65,280	29,909	50,627	46,943	47,136	15,712	0	299,030

2004

PROJECT	CRAFT HOURS Ironworker	Pile Driver	Op. Engr	Laborer	Carpenter	Conc. Finisher/ Cement Mason	Mech/Electr	PROJECT TOTALS
SFOBB Replacement	65,280	28,560	20,400	0	0	0	0	114,240 DONE
SFOBB West Span Retrofits	Structural: Rebar:							
Carquinez (East Bridge) Retrofit	Structural: Rebar:							
Carquinez West Replacement	Structural: Rebar:							
Carquinez, other: Crockett I/C Approach Span, New Maint. Station, Roadway Work								
San Mateo-Hayward Widening	Structural: Rebar:							
Benicia-Martinez Replacement (Abutment to Abutment)								
Benicia-Martinez Retrofit								
Richmond-San Rafael Retrofit (EAs 043821, 043841)								
CRAFT TOTALS	65,280	28,560	20,400	0	0	0	0	114,240

SUMMARY

PROJECT TOTALS, All Years	CRAFT HOURS Ironworker	Pile Driver	Op. Engr	Laborer	Carpenter	Conc. Finisher/ Cement Mason	Mech/Electr	PROJECT TOTALS
SFOBB Replacement	1,173,000	1,073,040	1,532,040	281,520	1,020,000	663,000	387,600	6,130,200
SFOBB West Span Retrofits	1,229,922	13,495	201,514	234,715	235,680	78,560	N/A	1,993,886
Carquinez (East Bridge) Retrofit	240,100	31,600	68,651	65,650	36,600	4,000	4,950	451,551
Carquinez West Replacement	155,040	136,680	55,080	51,000	26,520	N/A	N/A	424,320
Carquinez, other	97,920	120,360	97,920	324,360	95,880	12,240	24,480	773,160
San Mateo-Hayward Widening	160,674	38,302	66,551	130,067	148,257	49,420	0	593,271
Benicia-Martinez Replacement	220,000	62,000	74,000	370,000	340,000	62,000	5,000	1,133,000
Benicia-Martinez Retrofit	316,200	291,720	575,280	6,120	291,720	291,720		1,772,760
Richmond-San Rafael Retrofit	319,000	90,000	109,000	534,000	300,000	242,000	46,000	1,640,000

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Memorandum

TO: Bay Bridge Design Task Force

DATE: April 8, 1998

FR: Steve Heminger

RE: TRB special issue on bridges

In the January/February issue of its magazine, the Transportation Research Board (TRB) published a special issue on highway bridges. Attached are several articles from that issue that I thought might be of interest.

Perspectives on Future Highway Bridge Design

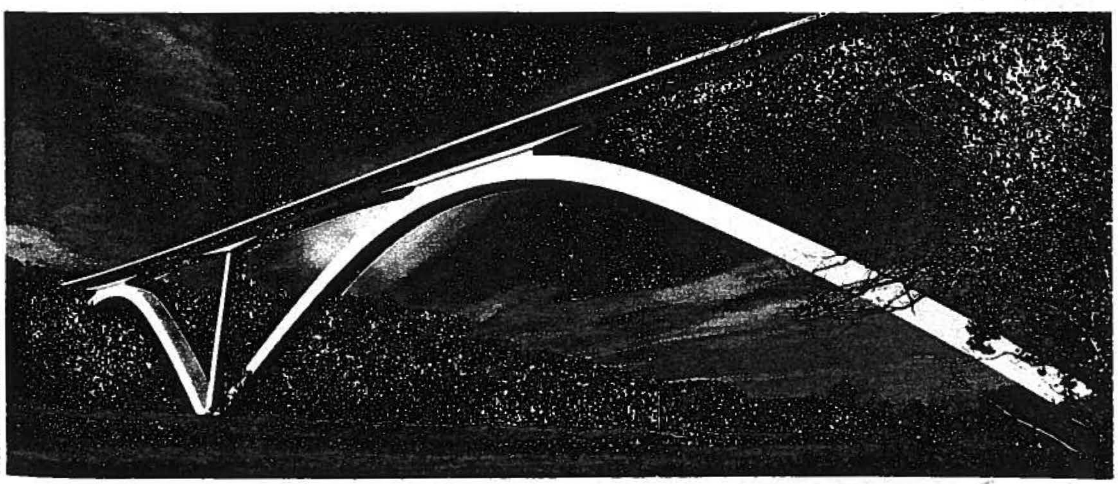
Highway Bridges of the Future

JOHN M. KULICKI

There is a great deal of interest within the bridge engineering research community as to what will constitute the highway bridges of the future. Significant attention is justifiably being focused on high-performance materials, including steel, concrete, composites, aluminum, and other materials with enhanced properties involving strength or durability. Efforts are also being directed to smart bridges that provide automated and integrated condition assessment reporting, as well as to passive and active control devices, activated by on-board sensors, that respond to changing loads. All these topics are valid subjects for current and future investigations, and doubtless over the long term we will see the introduction of reengineered existing materials, new materials, and adaptive bridges. However, for the next generation we are likely to find that most of tomorrow's bridges incorporate many of the features of today's or even yesterday's bridges. A large part of the inventory will not be so much new as renewed. Continued research expenditures are therefore warranted in the areas of life extension through remediation, improved analysis, and understanding of loads and load effects on existing structures. While it is tempting to divert resources to glamour topics, much basic work remains to be done.

The design and operations communities are more skeptical about the concept of passive control of structural response than about materials per se, and are even more skeptical about active control. Engineers are concerned about the durability and cost-effectiveness of hardware. Many practicing engineers need to remember that we have had bridges utilizing some type of control system for more than 100 years. Movable bridges have had various types of sensing devices for the position of wedges and locks, the skew and alignment of components, positioning of the moving elements, public safety features, motors, and brakes. Microcomputer logic and process-control features have been implemented on these structures through programmable logic controllers. Although there is an axiom that a movable bridge is a bridge requiring maintenance, this relates mostly to wear and tear on mechanical elements, not control and sensor features. In sum, it is necessary to maintain an open mind with regard to future possibilities.

The author is president and chief engineer, Modjeski and Masters, Inc.



FIGG ENGINEERING GROUP

Completed Natchez Trace Parkway Arches, designed by Figg Engineering Group, with 582-foot arch span, and measuring 155 feet from Tennessee Route 96 to top of bridge. Predominant span is 246 feet variable depth. Piers are tapered, and arch varies in depth.

Tomorrow's Steel Bridges

JOHN W. FISHER

TOMORROW'S STEEL BRIDGES will be built with improved steels, new advanced designs, and better fabrication. Clean low-carbon (<0.08) alloy bridge steel (copper-nickel) will yield strengths of 350 to 700 megapascals (MPa). These high-strength materials will improve weldability, formability, fracture resistance, and ductility as compared with present bridge steels.

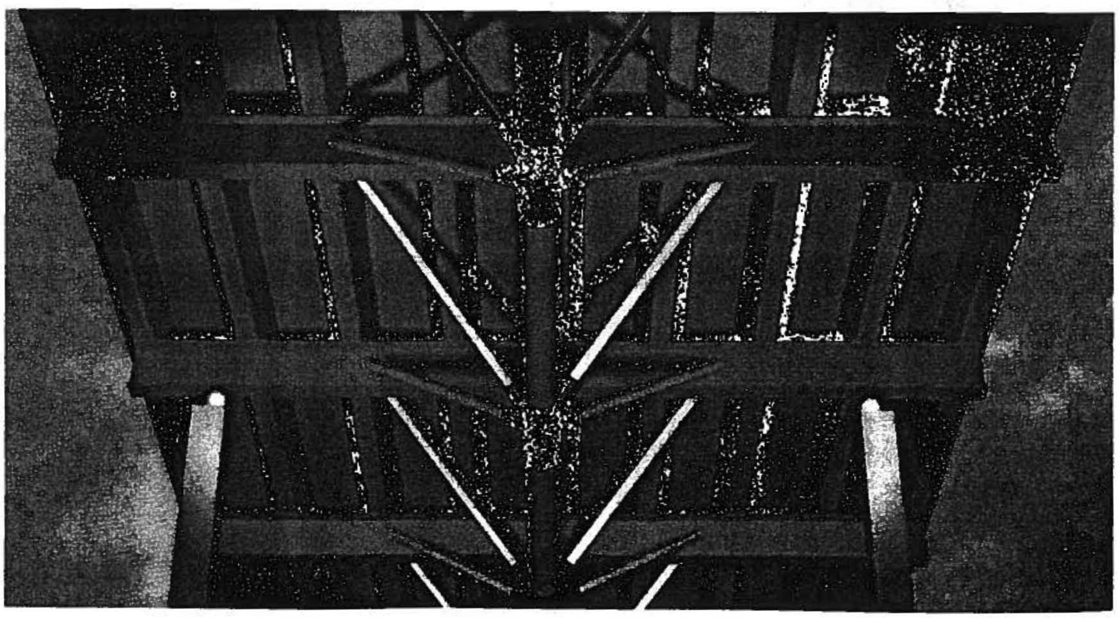
The new ease of making welded connections will not only decrease cost because preheating will not be needed, but also increase quality and reliability as a result of better working conditions. Weldment systems incorporating improved high-strength weld metals and high-purity consumables will produce joints free of cracking and other process-related defects.

To utilize these materials effectively, particularly above 500 MPa, new innovative structural forms are needed, such as composite or corrugated webs that make it unnecessary to weld transverse stiffeners and diaphragm connection plates to the girder to provide web stability for spans that exceed 35 meters. Bottom flanges will make greater use of post-tensioned tubes in both plate and box girders, providing fracture- and fatigue-resistant cross sections that will eliminate redundancy concerns. High-performance cast steel nodes will allow optimal fatigue-resistant splice details for truss, girder, and box girder bridges, including bracing and truss members. Innovations will occur as well in cable-suspended bridges with new cable systems, end fittings, and corrosion protection. There will also be an increased focus on modular and composite systems that are easily installed and repaired or replaced.

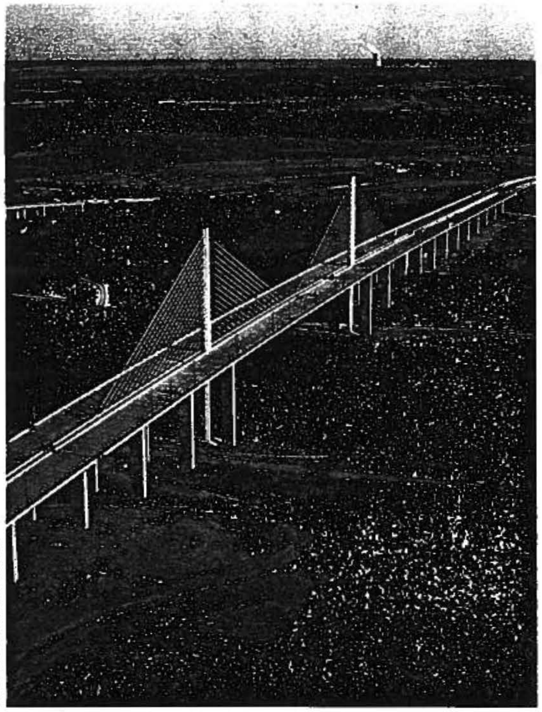
High-performance concrete decks will provide greater resistance to deterioration and optimal composite cross sections. They will utilize precasting, post-tensioning, and modular components to minimize shrinkage and tensile cracking, and to provide rapid replacement and more durable wearing surfaces. There will be greater use of orthotropic deck systems with modular components fabricated from steel, aluminum, or fiber composite materials in a factory environment. It will be possible to apply high-performance wearing surfaces to these modular components under controlled conditions for enhanced durability. More durable and crack-free decks will also allow greater use of high-performance weathering steel as more effective ways are found to keep roadway salts and dirt and debris off the structure.

Finally, designs will incorporate means of monitoring tomorrow's bridges. Strain transducers, corrosion monitors, and crack-detection sensors are among the devices that will allow continuous monitoring for damage detection, while providing a means to assess service life and permit more rational repair intervals so the public is provided safe and convenient systems.

The author is Joseph T. Stuart Professor of Civil Engineering and director, Center for Advanced Technology for Large Structural Systems, Lehigh University.

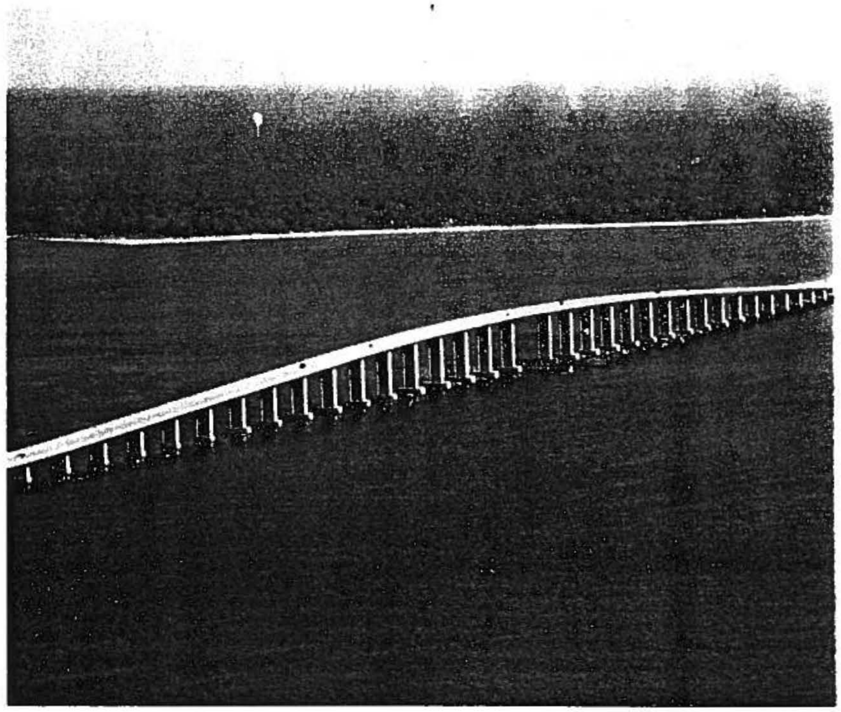


Tomorrow's bridges will incorporate innovations in materials, design, fabrication, and erection. These innovations will also lead to enhancements in maintenance and retrofits for existing bridges.



FIGG ENGINEERING GROUP

The Chesapeake & Delaware Canal Bridge, a precast segmental superstructure with a 750-foot cable-stayed main span, is located in St. Georges, Delaware.



The Mid-Bay Bridge, a precast segmental superstructure with a 225-foot main span, is located on Choctawhatchee Bay in Okaloosa County, Florida.

Crossing into a New Age

EUGENE C. FIGG, JR.

THERE IS TODAY A PUBLIC DEMAND for signature bridges that have a life of 100 years. Similarly, there is a public need for innovative financing to stretch available transportation dollars for bridges. Cost savings, life-cycle costs, aesthetics, and material improvements will make segmental concrete the future choice for long span cable-stayed bridges.

The completion of the Sunshine Skyway Bridge in Tampa, Florida, in 1987 demonstrated that a community can have an economical signature bridge reflecting that community's vision, and this trend will continue. The 17th Street Bridge in Ft. Lauderdale, Florida, was designed using the charette process to develop a bridge the community wanted. Likewise, the Wabasha Street Bridge in St. Paul, Minnesota, was designed by a special committee of artists, architects, and other interested citizens established by the mayor.

Innovative financing will be the primary means of accomplishing large bridge projects in the future. The 5.87-kilometer (19,265-foot) Mid-Bay Bridge in West Florida was completed in 1993 as a toll bridge, with $81 million in revenue bonds covering all costs. There was no federal money involved in the project, and state and county loan money was paid back from the bond issue.

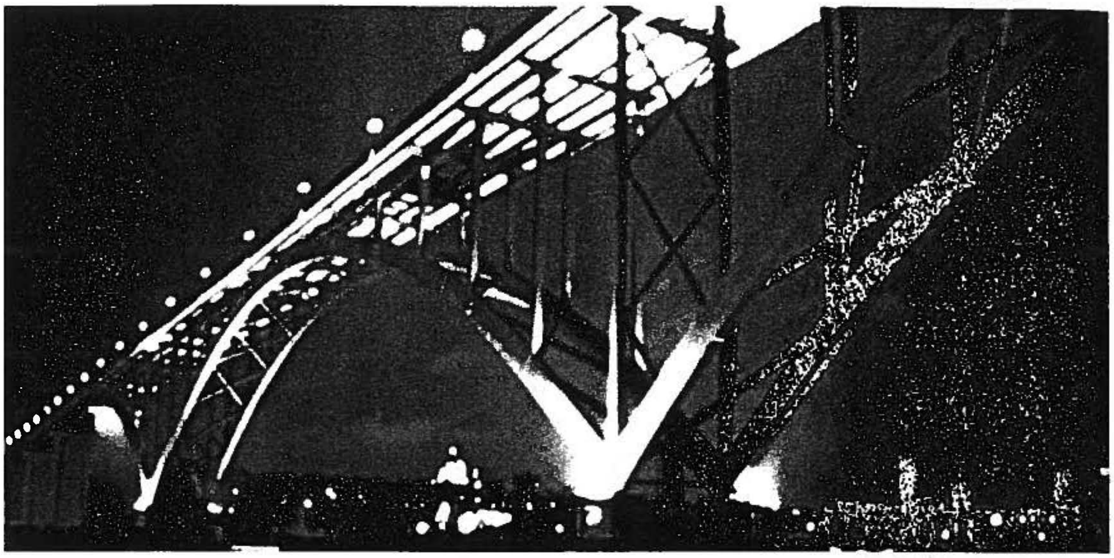
Bridge owners concerned about life-cycle costs will demand manuals showing maintenance inspections and rehabilitation designed to extend the lives of bridges. The Port Authority of New York and New Jersey's analysis of life-cycle costs was one reason for its design choice of a precast concrete segmental cable-stayed 225.55-meter (740-foot) span bridge to Staten Island.

Segmental concrete, introduced in America more than 20 years ago as an economical and aesthetic solution for many bridge types, has now taken its place as the future for long span cable-stayed bridges. The precast segmental Chesapeake & Delaware Canal Bridge, for example, has innovative design features that allow long span bridges to be built economically. High-performance concrete and structural lightweight concrete will continue to improve segmental concrete cable-stayed bridges.

Bridge aesthetics and costs are and will continue to be dominant factors. The need to balance these factors will keep bridge engineering firms looking for new materials, such as fiberglass and fiber carbon, as well as improving existing materials.

The Sunshine Skyway Bridge, a precast segmental superstructure with a 1,200-foot cable-stayed main span, is located in Tampa, Florida.

The author is president, Figg Engineering Group.



The High Bridge over the Mississippi River in Minneapolis-St. Paul, designed by T. Y. Lin, was completed in 1983.

Aesthetics and Economics: Which First?

T. Y. LIN

Most of the ancient arch bridges that still survive are graceful and beautiful. Economics was seldom, if ever, a formal consideration in the design of these structures. Bridges built of stone slabs and timber planks, though probably quite economical, were hardly considered works of art. Since the Industrial Revolution, however, roads and rivers have demanded many crossings. Engineers in a rush to build spans to meet this demand and limited by costs and budgets focused only on economics so as to be able to build more bridges. Although beautiful structures, such as the Golden Gate Bridge, were occasionally constructed, by and large bridges were standardized for economical mass production and engineered to serve functional purposes without regard to aesthetics. Engineers were often proud not to waste money on appearance and ornamentation.

Recently, the public has begun to demand more graceful bridges consisting of more than concrete beams and steel girders. Engineers are now often expected to improve structures both environmentally and aesthetically without destroying urban and suburban natural beauty. Some engineers, however, believe that aesthetic bridges are incompatible with economical design, and fail to realize that modern technology can in fact help produce space and forms that are both beautiful and economical. In fact, aesthetic bridges attained through technology frequently represent the most economical designs as well. Therefore, the question is not which comes first—aesthetics or economics; rather, both can be achieved simultaneously.

An example is the proposed Ruck-A-Chucky Bridge over the American River in Auburn, California, which would span 1,300 feet on a horizontal arc across a 450-foot-deep waterway to be created by the planned Auburn Dam. Originally, a straight bridge was considered, requiring two tunnels, one at each end, piercing into the hillside and turning out. The proposed curved design would enable the route to follow contours without the two tunnels, thus achieving great economy with a beautiful formation of cables.

Another example is the High Bridge over the Mississippi River in Minneapolis-St. Paul, completed in 1983. The site naturally accommodates a high arch, permitting navigation. As a result of post-tensioning of the bridge deck with steel cables, the center span of 500 feet is flanked by two half-arches, joining smoothly into the approach spans. This winning design was selected from among 18 competing concepts, being deemed the most aesthetic while costing no more than the other designs.

Unfortunately, the coincidence of aesthetics and economics does not occur with every bridge. On some occasions, a good-looking bridge will cost more, or the most economical bridge will look cheap. In such cases, it is necessary to seek optimum solutions considering both aesthetics and economics—not deciding which comes first, but spending the necessary money to attain the aesthetics judged to be worthwhile.

The author is chairman of the board, Lin Tung-Yen China, Inc.

Bridges as Symbols

MARTIN P. BURKE, JR.

The author is bridge consultant, Burgess & Niple, Limited, Columbus, Ohio.

> On April 13, 1995 an estimated 10,000 people gathered beside Rotterdam's main waterway as a flotilla of tugs and small boats celebrated the erection of the city's new bridge. At the beginning there was no bridge. By the end of the day the 125 meter (413 foot) pylon and deck of a startling new addition to the Rotterdam skyline were in place.(*1*)

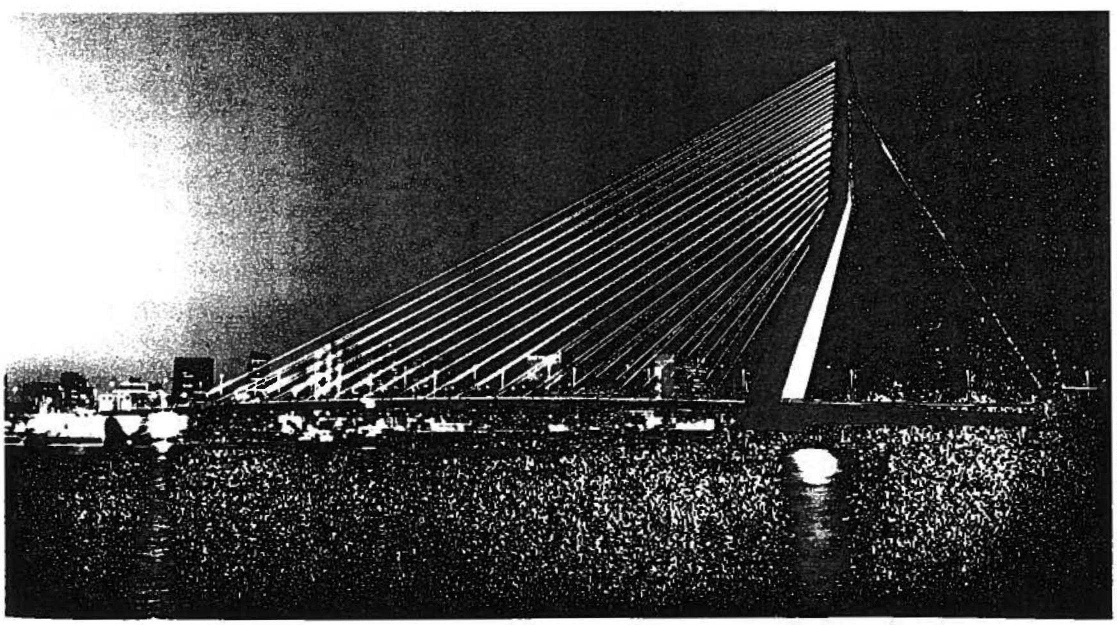
Thus is reported not only the erection of the Erasmus Bridge (below), but also the creation of a new symbol, one that should grow stronger and more powerful as the years unfold and images of this bridge become more generally familiar.

EDITOR'S NOTE: *This article is part of the* TR News *Point of View series in which opinions of contributing authors on transportation issues are presented. The views expressed do not necessarily represent those of TRB or* TR News. *Readers are encouraged to comment on the issues and opinions presented in this series in the form of a letter to the editor.*

What is most valuable about the Erasmus Bridge and its relationship with the city that commissioned and funded its design and construction? Is it the utilitarian purpose of providing a safe and durable waterway crossing, or the bridge's power as a new symbol for the city? What meanings or messages are conveyed by this bridge and its published images? Was the cost of creating the bridge commensurate with the value of its functions? This brief look at bridges as symbols cannot fully answer such questions. It can, however, provide some insight on why bridges become endowed with meaning, as well as why some bridges have become powerful symbols for the cities they serve.

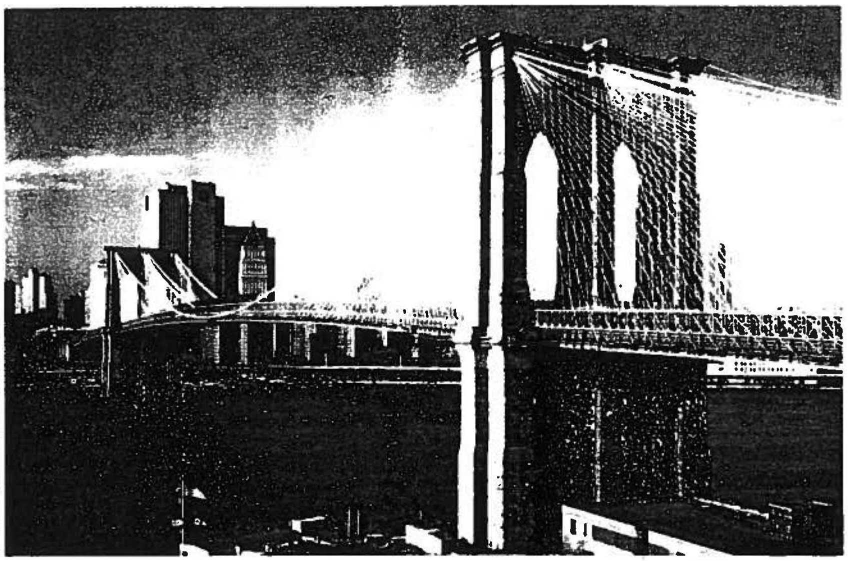
Erasmus Bridge

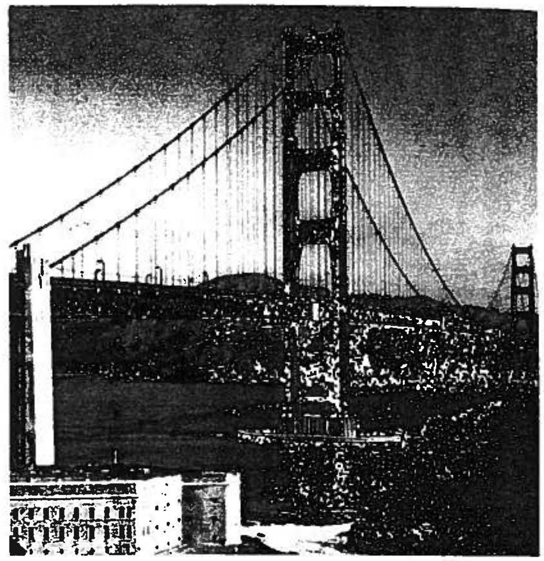
The Erasmus Bridge, a beautiful asymmetrical cable-stayed bridge designed by Ben van Berkel of Amsterdam, was built by a joint venture between Grootint/Heerema and Belgian contractor CFE/MBG. Completed in 1997, it spans the Maas River



BEN SEELT AND THE JOINT VENTURE OF GROOTINT/HEEREMA AND BELGIAN CONTRACTOR CFE/MBG

Erasmus Bridge of Rotterdam.





Bridge symbols for New York (Brooklyn Bridge), *(left)* and San Francisco (Golden Gate Bridge).

and provides access from the city proper to an old dock area being revitalized into a mixed-use urban development project. The bridge was named to honor and reinforce the memory of Desiderius Erasmus, one of Rotterdam's most illustrious citizens and an internationally famed 15th-century writer and humanist.

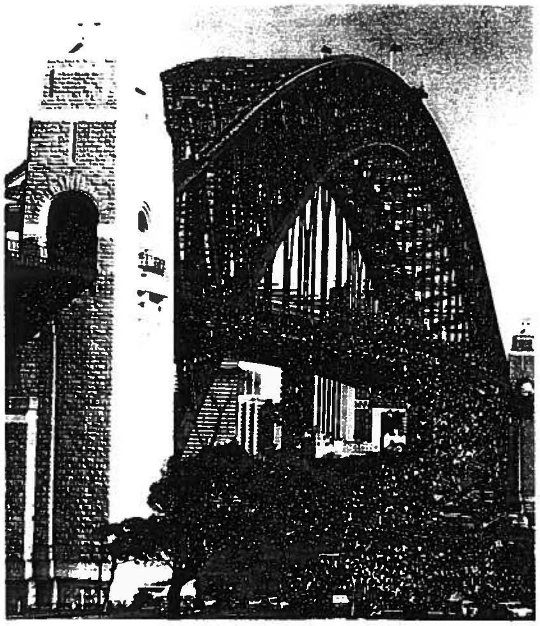
As implied by the dramatic appearance of its fan-shaped cables and its bent and inverted Y-shaped steel pylon, this bridge was designed for multiple purposes, not just to provide a strictly utilitarian vehicular and pedestrian waterway crossing. In addition to its explicit transportation and memorial purposes, its name and modern presence—in contrast with older structures of the city—should serve as a mute reminder of the city's cultural, intellectual, and historical heritage. Similarly, the bridge's technologically advanced design and construction should serve as a motivator for and predictor of a technologically and scientifically advanced future for the city. At the same time, however, the strong emphasis on the bridge's visual aspects, as evidenced by its dramatic appearance, suggests a future for the city dedicated primarily to improving the human condition. Finally, and significantly, published images of this bridge should make it a powerful international symbol for the city of Rotterdam itself.

Symbolic Power of Bridges

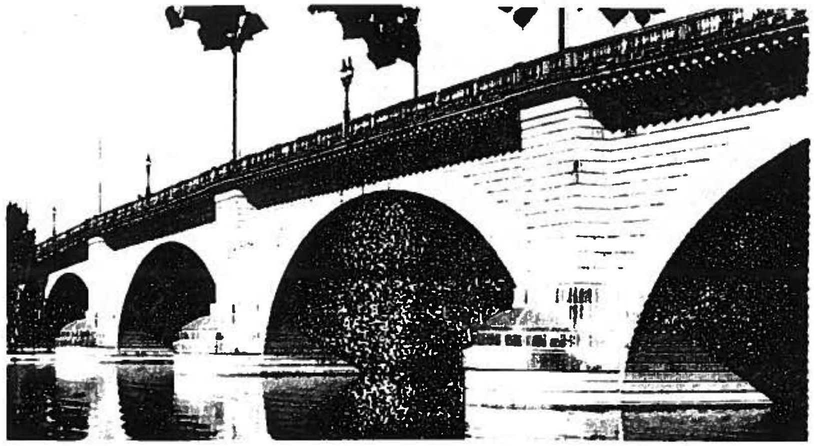
A symbol is generally understood to mean "something chosen to stand for or represent something else; especially an object used to typify a quality, abstract idea, etc." (2,p.1357). Symbols are particularly useful and effective when they are used to represent abstractions with multiple meanings. For example, the word "city" is variously defined as a place inhabited by a large, permanent community; a geographical political area; a center of trade and culture; the structured environment at a particular location; and a place where a certain group of people lives. To differentiate one city from another in speech or writing, each is symbolized by a different name.

Because the name of a particular city will for most individuals provoke a vague image of a cluster of buildings or the skyline of the city's major buildings, cities are most effectively symbolized visually by an image of a unique or major structure. Such a structure is frequently a building (e.g., Eiffel Tower of Paris, Sears Tower of Chicago, Gateway Arch of St. Louis, Independence Hall of Philadelphia, Alamo of San Antonio). On the other hand, most major cities are transportation centers because they were founded at intersections between primary overland routes and major waterways. As a result, these cities have large bridges, many of which have attractive configurations and/or great size, or represent significant personal and technical achievement (see photographs above and page 33). Because of all these attributes, bridges instead of buildings have often been adopted as symbols for these cities.

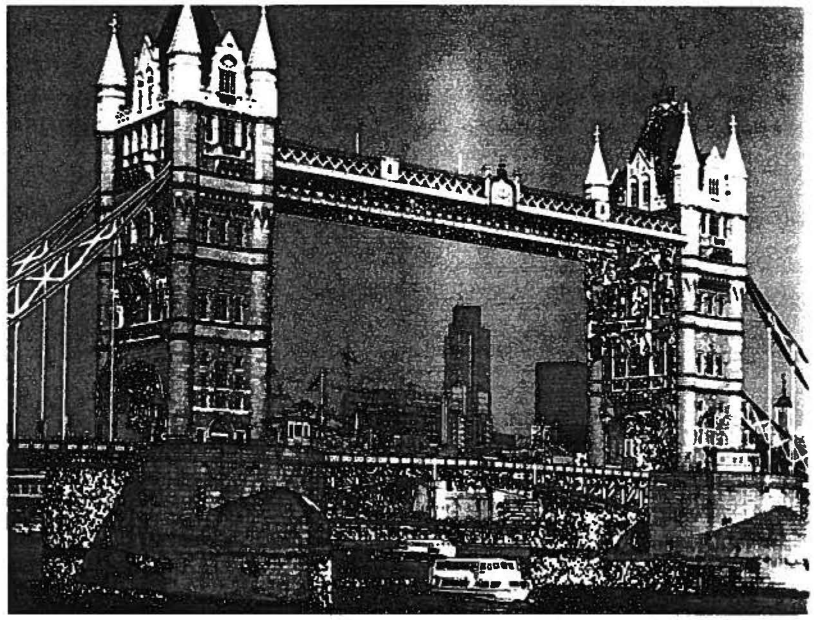
What characteristics must a bridge have to be an effective symbol? The most effective symbols are those recognized by the largest audience. Bridges that have received the most publicity because of their record-breaking span or size, unusual shape or configuration, or association with significant historical events and personal affairs have the most symbolic power. Such bridges, however, must also have a distinguished appearance and widespread visual appeal. Regardless of the significance of its characteristics and associations, an unattractive bridge stands little chance of being adopted as the symbol for a city. Unattractive bridges have sym-



NEW SOUTH WALES ROADS AND TRAFFIC AUTHORITY



HISTORIC AMERICAN ENGINEERING RECORD



Bridge symbols for *(clockwise from left)* Sydney (Sydney Harbor Bridge), Lake Havasu (London Bridge), and London (Tower Bridge).

bolic power, but such power has significant negative connotations and emotional effects.

A structure's symbolic power is not constant. That power can strengthen as the bridge ages and survives its competitors, or wane as its primary characteristics are eclipsed by those of another structure. Moreover, as with other symbols, the symbolic power of bridges can be enhanced or diminished by the type and magnitude of meanings with which the bridge becomes endowed as a result of the passage of time and associations with various persons and events.

Before a house becomes a home, meaning is bestowed on it by the architect who gives it form and the craftsmen whose care and attention give it beauty. Nevertheless, the house is endowed with the most meaning by successive generations that make it home and by its presence during events that shape their lives. Other structures, including bridges, are similarly endowed with meaning. The Tower of London, the Alamo of San Antonio, Independence Hall of Philadelphia, the fractured tower of Kaiser Wilhelm Memorial Church of Berlin, the Atomic Dome of Hiroshima, and the Golden Gate Bridge of San Francisco are familiar examples.

The Golden Gate Bridge was the last mainland structure seen by the author on his way by water to the war in the Pacific, and its silhouette was the first familiar landmark seen on the horizon on his return to the mainland at the war's conclusion. In contrast, consider the meanings and emotional reactions associated with images and recollections of this bridge by descendants of its builders, or by families that have lost loved ones who leapt from its deck, or by the few who know little or nothing about the bridge and are otherwise preoccupied with their own personal problems. Although most well-informed people would recognize the Golden Gate Bridge as a symbol for San Francisco, the meanings and emotions evoked by its appearance will be as different as the individuals who view it and their familiarity with the structure. Thus the meanings that become associated with structures and the emotions they provoke can supplement or counteract a structure's symbolic power and its suitability as a symbol for a city.

Summary

Every characteristic of a bridge, including its setting and its association with other structures, persons, and events, gives it symbolic power and meaning.

The most attractive bridges with the greatest symbolic power and most positive meanings have the greatest potential to be adopted as a symbol for a city. In contrast, unattractive bridges, regardless of their symbolic power, are the least suitable for this purpose. They may have symbolic meaning, but it will not be positive. They may symbolize the lack of aesthetic talent by an agency's design staff, neglect or social insensitivity by agency officials who supervised and approved their design, preoccupation with other concerns by public officials who authorized and funded their construction, or all of these in an unfortunate coincidence of design and administrative actions. Worst of all, unattractive bridges also symbolize a passive or complacent society that tolerates the placement of such structures in its communities.

The more socially and culturally conscious communities and transportation agencies now recognize the symbolic power of bridges and the meanings that can become associated with them. Control is therefore exercised over the design and construction of bridges to ensure that their appearance will have a beneficial visual impact on their setting. The Erasmus Bridge and many other such bridges are outstanding examples of the recognition that the aesthetics of a bridge are as important to the image and welfare of the community it serves as its safety is to the traffic it bears.

References

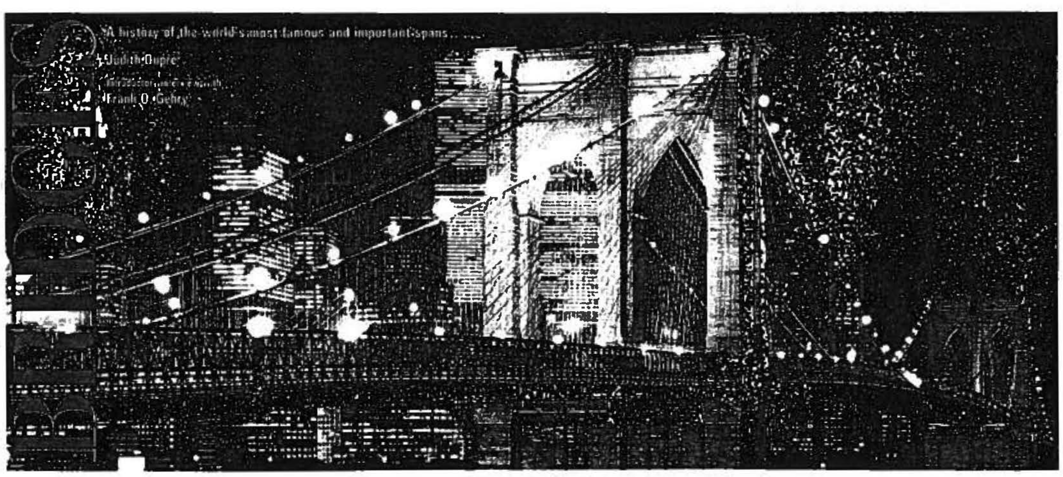
1. The Erasmus Bridge. *Bridge Design and Construction*, May 1996, insert between pp. 34 and 35.
2. *The Reader's Digest Great Encyclopedic Dictionary.* The Reader's Digest Association, Pleasantville, New York, 1968.

Bridges: A History of the World's Most Famous and Important Spans

Judith Dupré. Black Dog and Leventhal Publishers, Inc., 151 West 19th Street, New York, NY 10011 (telephone 212-647-9336); 1997; $22.98, hardcover; ISBN 1-884822-75-4; 128 pp.

This book was designed in horizontal format so that most of its splendid photographs need not be split across two pages. Organized chronologically, the book includes 46 bridges from around the world. It begins with the Pont au Gard, a Roman aquaduct that crosses the Gard River in southern France (completed in 18 B.C.), and ends with the Tatara Bridge in Japan, which will be the world's longest cable-stayed bridge when it is completed in 1999. For each bridge, a photograph spanning at least a full 18-inch page and a concise history and description (with several smaller photos) are provided.

In addition, scattered throughout the book are sections on general topics related to bridges, such as "Bridge Basics," describing the three broad types of bridges; "Garden Bridges"; "Catastrophe," covering bridge collapses throughout history; "Covered Bridges"; and "The Bridges of War." Also included are the author's interview with architect Frank O. Gehry and a glossary of bridge-related terms.



Condition of the Nation's Highway Bridges
A Look at the Past, Present, and Future

EDGAR P. SMALL AND JAMES COOPER

In many endeavors it is useful and often informative to step back periodically and look at the big picture—to examine where we have been, where we are today, and where we are going. Doing so helps place things in proper perspective and ensures that we are on the right track. Bridge engineering is no exception.

Edgar P. Small is research structural engineer and James Cooper is chief, Structures Division, Federal Highway Administration.

Where Have We Been?

Before and during the 1960s, the bridge engineering community focused on new construction. With the advent of the Interstate construction boom, significant efforts were devoted to the development of the nation's highway bridge and road infrastructure. Maintenance, repair, and rehabilitation were performed on an as-needed basis employing the best practices of the day. This responsive approach to maintenance of the highway bridge network appeared sufficient to address any potential safety issues; thus, national standards for bridge inspection and condition evaluation did not exist. The tragic collapse of the Silver Bridge during rush-hour traffic in 1967 focused the nation's attention on bridge safety. The bridge engineering community came to realize that the existing procedures and responsive approaches were inadequate.

The need for a mechanism to allow for the systematic evaluation of structural safety was recognized, including national standards that would permit the appraisal of network-wide conditions. New requirements for safety inspection, maintenance, condition rating, and structural evaluation were drafted and enacted. Formal requirements were developed through a cooperative effort between state departments of transportation and the Federal Highway Administration. The resulting provisions were implemented through the National Bridge Inspection Standards (NBIS), issued in April 1971. These provisions mandated the establishment of accepted, uniform procedures for the collection and maintenance of inventory and inspection data, minimum qualifications for bridge inspection personnel, and standardized methods for evaluation and appraisal of bridge conditions. These standards served as the basis for today's better understanding of the condition of the bridge network and ways of making better infrastructure investments to provide safe, useful bridges.

The standards were established to flag conditions that could compromise safety. Deterioration in steel and concrete bridges may affect the structure's ability to perform as designed. Bridges will sometimes crack when subjected to periodic multiple loads (fatigue). If unchecked, such conditions will jeopardize the structure. Heavy transportation may overload the bridge, causing excessive stress on the bridge components. Sometimes vehicles collide with structures and damage them. Moreover, natural hazards and extreme events compromise the ability of a bridge to carry traffic. Floods may occur and compromise the bridge foundation. Earthquakes may cause significant damage to individual structures and emergency response routes, thus endangering the traveling public and the surrounding community (in addition to resulting in losses of investment). Such conditions must be considered by the bridge engineering community to ensure bridge safety and preservation.

Data collected and maintained through periodic bridge inspections provide the basis for preservation and safety efforts. Each state collects and maintains, as a minimum, the data required by the new standards. This information is submitted annually by the states to FHWA, where it is maintained in the National Bridge Inventory (NBI) database. The NBI data support federal funding programs, such as the Highway Bridge Repair and Rehabilitation Program and the Special Bridge Program, which provide discretionary funding. Such programs facil-

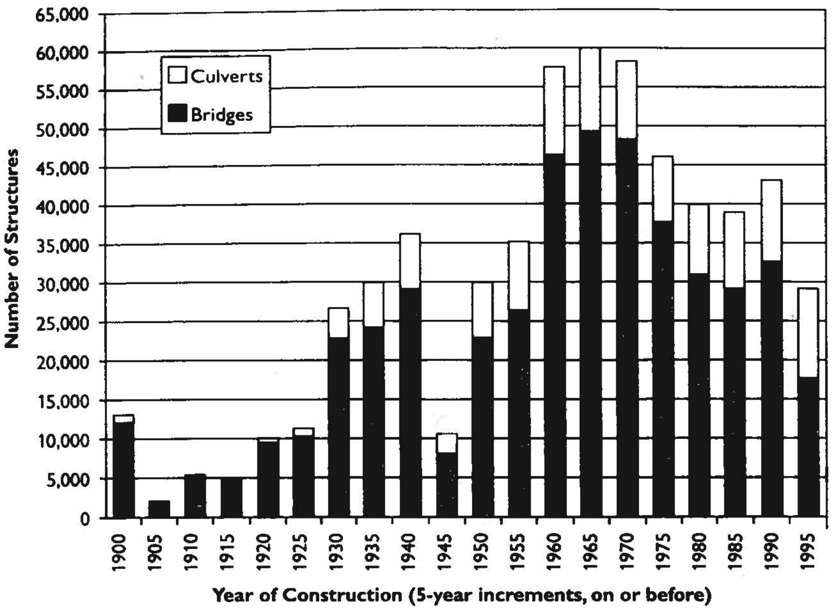


FIGURE 1 Year of construction distribution for bridges and culverts.

itate the initiation and performance of required work on the bridge network.

The NBI information, collected and maintained for more than 25 years, represents the most comprehensive source of information on the status of the U.S. highway bridge network. Significant insight into the composition and condition of bridges can be obtained through examination of the NBI data. Stepping back and performing such an examination yields valuable insight into where we are today.

Where Are We Today?

In the 1995 archival NBI database, records are maintained for approximately 590,000 structures that are more than 20 feet in length. (Structures of less than 20 feet are not maintained and recorded in the NBI, although individual states may elect to record and maintain information on these smaller structures.) Roughly 80 percent (475,850) of the NBI records describe bridges, while 20 percent (114,435) describe culverts (which are smaller structures typically used for drainage openings, pedestrian underpasses, and livestock crossings beneath roadway embankments). From a funding standpoint, bridges and culverts may be considered together; however, when addressing the composition of the network, a distinction should be made between the two types of structures. In this discussion, culverts and bridges are therefore treated separately.

Examination of the character, composition, and condition of the structures maintained within the inventory provides useful insights. Considering the year of construction distribution for bridges in service, as depicted in Figure 1, the Interstate construction boom that occurred from the late 1950s through the 1970s is evident. The average age of structures is highly influenced by this peak period of construction. Roughly half of all structures in service today were constructed during this 20-year period. Many structures are now 30 to 50 years old, and are beginning to require increasing maintenance, repair, and rehabilitation and functional improvements. Many are approaching the end of their design service life and will require replacement in the near future. It is anticipated that network-wide needs will dramatically increase as these structures continue to age.

Additional observations and insights can be derived by examining other variables. For example, the percentages for each of the major superstructure material types for the 475,850 highway bridges are shown in the upper portion of Figure 2. This figure also shows the percentages by the total number of structures and by the cumulative traffic carried (average daily traffic, or ADT). By either measure, steel structures predominate; however, there are also significant percentages of concrete, prestressed concrete, and timber bridges. Figure 3 shows the influence of new materials and technology. Prestressed concrete, first used in the early 1950s, has become the material of choice for new bridges. Today almost half of the bridges constructed nationwide have prestressed concrete superstructures. Bridges with timber superstructures represent roughly 9 percent of the number of bridges in the inventory, and yet account for less than 1 percent of the total daily traffic volume. It would thus appear that bridges with timber superstructures are located primarily on low-volume roadways, such as rural collectors and local roads. This observation is confirmed in Table 1, which presents percentages for superstructure material types and functional classification for both number of bridges and traffic volume.

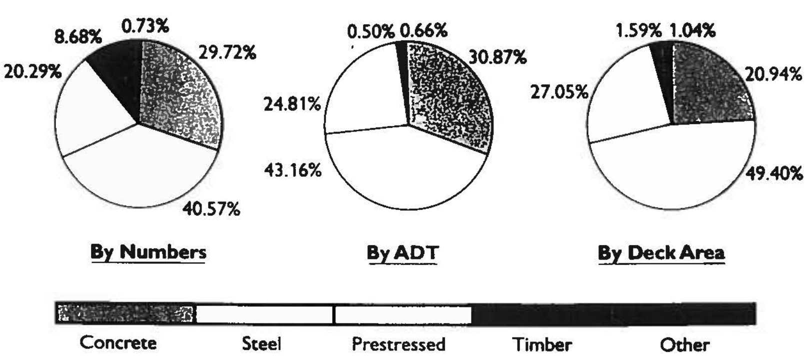


FIGURE 2 Superstructure material types used and traffic carried for bridges and culverts.

TABLE 1 Percentage of Bridges and Traffic Carried by Material[a]

Functional Classification	Concrete	Steel	Prestressed	Timber	Other	Total
Percentage of Bridges by Material						
Interstates/Expressways	11.33	13.77	17.45	0.04	15.28	12.61
Other Principal Arterials	11.15	8.36	11.66	0.98	7.90	9.22
Minor Arterials	12.09	8.16	9.60	2.52	12.21	9.16
Collectors	32.54	22.82	25.62	19.86	25.33	26.04
Local	32.89	46.89	35.67	76.60	39.29	42.97
Percentage of Traffic by Material						
Interstates/Expressways	56.32	63.71	62.41	2.85	42.89	60.67
Other Principal Arterials	20.16	17.15	17.63	10.40	20.97	18.19
Minor Arterials	10.98	8.61	8.44	15.54	19.44	9.41
Collectors	8.60	6.46	6.91	34.26	11.55	7.41
Local	3.94	4.06	4.60	36.95	5.15	4.33

[a] Based on the 1995 NBI. Information is presented for bridges exclusive of culverts.

Further examination of the information contained in Table 1 reveals the importance of Interstate and principal arterial structures. Fewer than one-quarter of all bridges are classified within these two functional categories, yet these structures service 80 percent of the total daily traffic volume. Such structures (Interstates, other expressways, and other principal arterials) are thus of singular importance to the nation's economy, defense, and mobility. Bridges required for intermodal connectivity, as for ports and railways, may carry smaller volumes of traffic, but are equally important to the nation's economic well-being and defense.

In 1995 the National Highway System Designation Act was signed into law. This legislation officially designated over 260 000 kilometers (161,000 miles) of roadways as essential for the nation's economic vitality, defense, and mobility. The National Highway System will serve as "the backbone of our national transportation network in the 21st century. It is going to affect every American either directly or indirectly" (*1*,p.29). More than 20 percent of the nation's highway bridges are on the National Highway System. These structures comprise better than 50 percent of the total bridge deck area in the United States and bear 80 percent of the total traffic volume carried by the bridge network. The significance of highway bridges as critical links in the nation's surface transportation system quickly becomes evident.

Performance and Health of the Nation's Highway Bridges

Standard indexes have been developed over the years to gauge the health and performance of highway bridges. These indexes are based on information maintained in the NBI: the health of a structure is expressed in terms of structural deficiency, while the performance is expressed in terms of functional obsolescence. A bridge is classified as structurally deficient if the condition of the deck, superstructure, or substructure is poor or worse. The bridge can also be structurally deficient if its load-carrying capacity is very low or if there are frequent delays due to flooding. In this case, the classification does not imply that the structure is unsafe, but indicates that deterioration or other processes are beginning to affect its serviceability and functionality. Thus a low rating serves to flag the structure's need for attention, enabling proactive mitigation of potential safety problems before they occur.

Functional obsolescence is the result of narrow bridge deck widths, inadequate clearances (horizontal or vertical), or unsafe geometrical alignments. A bridge may also be classified as functionally

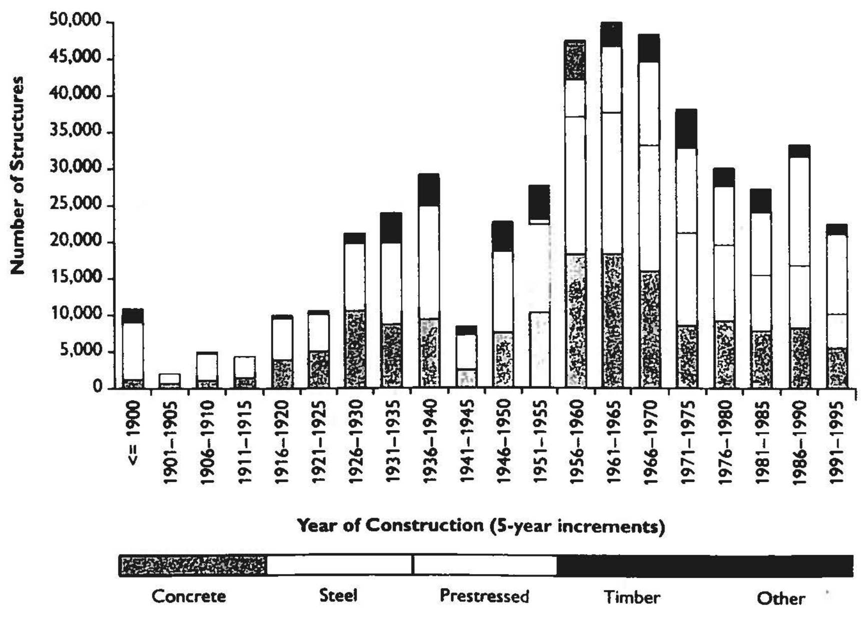


FIGURE 3 Year of construction for bridges by superstructure material.

TABLE 2 Bridge Deficiencies[a]

Deficiency Type	Number of Bridges	Percent of Bridges	Percent of Total ADT Carried
Only Structurally Deficient	50,438	10.60	4.56
Only Functionally Obsolete	88,716	18.64	28.96
Structurally Deficient and Functionally Obsolete	54,028	11.35	7.30
Total	193,182	40.59	40.82

[a] Based on the 1995 NBI. Information is presented for bridges exclusive of culverts.

obsolete if the design load-carrying capacity does not adequately service load demands or if frequent flooding occurs. Thus functional obsolescence implies that the structure is not adequately servicing the traffic demands placed upon it by the traveling public.

Percentages of structural deficiency and functional obsolescence are shown in Table 2 by number of bridges and total volume of traffic carried. Of the approximately 104,500 bridges in the category of structurally deficient or structurally deficient and functionally obsolete (roughly 20 percent of the total bridge population), about 78,000 have inadequate (poor or worse) condition ratings, 53,300 have inadequate structural appraisal ratings, and 3,100 have inadequate waterway ratings. Further categorization reveals that of the 78,000 structures with poor or worse condition ratings, 36,000 have poor deck conditions, 40,000 have poor superstructure conditions, and 50,000 have poor substructure conditions.

As noted, functional obsolescence results from inadequate deck geometry, underclearances, geometric alignment, structural appraisal ratings, and/or waterways. Physical characteristics (deck geometry, underclearances, and alignments) are the primary cause of functional obsolescence. Of the approximately 142,000 functionally obsolete bridges, which represent roughly 30 percent of the total population, 100,000 have deck geometry appraisal inadequacies, 27,000 have inadequate underclearances, and 15,000 have inadequate approach alignments. There are also almost 19,000 bridges considered functionally obsolete because of inadequate structural appraisal ratings (low load-carrying capacity), and 5,000 bridges considered functionally obsolete because of waterway inadequacy.

Culvert Conditions

Unlike bridges, culverts are often embedded within the roadway embankment and show no clear distinction among the deck, superstructure, and substructure elements. The only distinguishing element for a culvert is the culvert itself. Culverts and bridges thus have different design properties and are subject to different loading patterns.

If one examines the composition of the culvert network, one finds little variation in material composition, in contrast with the bridge network as previously discussed. Close to 90 percent of culverts are constructed using reinforced concrete, with the remaining 10 percent constructed using steel. Further examination reveals that the use of culverts has been increasing. From the year-of-construction distributions presented in Figure 1, it can be seen that through the 1920s, culverts were used relatively infrequently, whereas today they comprise roughly 20 percent of all bridge and culvert structures built. This growth is primarily the result of the economical construction costs of culverts and their efficiency for small crossings. The use of culverts is expected to dominate the small crossing and underpass segment of the bridge market in the future.

With regard to culvert conditions, approximately 3.5 percent of the 114,000 culverts in the NBI are characterized as structurally deficient. The causes for structural deficiences in the culvert network, along with associated numbers of culverts, are as follows: 3,000 are structurally deficient as a result of inadequate culvert condition ratings, 1,300 as a result of inadequate structural appraisal ratings, and 300 as a result of waterway inadequacy.

As with bridges, functional obsolescence of culverts results from inadequate geometry, underclearances, and/or alignments; inadequate structural appraisal ratings; and low waterway adequacy ratings. Many culverts do not have traditional bridge decks. Bridge deck geometry ratings are not applicable for more than 65 percent of culverts, indicating that there is no roadway constriction over the culvert. Of the remaining culverts, 3,000 are functionally obsolete because of inadequate deck geometry, 820 because of inadequate approach roadway alignment ratings, 900 because of inadequate structural appraisal ratings, and 1,000 because of waterway inadequacy. In total, there are approximately 5,500 functionally obsolete culverts (roughly 5 percent of all culverts).

The lower percentage of culvert deficiencies relative to bridges can be attributed to two factors. First, these structures are much less complex than bridges, act integrally with the ground, and thus do not respond (move) as much under traffic loads. Second, the culvert population has a younger average age than the corresponding bridge population.

Status of Structures in NBI

In considering overall conditions, culvert and bridge records are combined. The combined data reveal that approximately 104,500 bridges and 4,000 culverts are classified as structurally deficient. These structures represent about 18 percent of the total inventory. Likewise, approximately 25 percent of the structures (140,000 bridges and 3,000 culverts) are functionally obsolete. It should be noted, however, that many of the functionally obsolete structures are also structurally deficient, as shown for bridges in Table 2. For funding purposes, structural deficiencies take precedence; therefore, structures with both types of deficiency are considered to be within the structurally deficient population instead of the functionally obsolete population. With this consideration in mind, approximately 10 percent of the structures are functionally obsolete (without structural deficiencies). Thus, approximately 30 percent of the structures within the national bridge and culvert network are considered deficient.

Where Do We Go from Here?

As documented in the Highway Bridge Repair and Rehabilitation Program Reports to Congress and summarized in Figure 4, the total number of deficient structures and associated percentages have been decreasing in recent years. The data shown in Figure 4 clearly reveal that deficiencies in the nation's bridges and culverts have been reduced. Although there are no definitive answers explaining these reductions, one can identify certain trends that indicate contributing factors. These trends include technology advances and a better understanding of how bridges respond to loads and the environment. Decreased deficiencies may also have resulted from increased funding for preservation (with associated decreased expenditures for new construction). This increased funding, however, is not considered a predominant factor since needs have increased in parallel.

The focus of new materials and designs has been on increased durability with fewer maintenance requirements. Precast concrete is the most frequently used material today, with concrete members being formed, placed, and cured under controlled environmental conditions. This approach greatly facilitates quality control and quality assurance, thus minimizing conditions that could adversely affect the properties of the concrete. New compliant coatings, epoxy-covered reinforcement, and high-strength, durable, low-weight materials have all advanced the state of the practice. Trends indicate better performance and, in most cases, lower life-cycle costs with increased safety. New designs have addressed details that have contributed to structural degradation in the past. Jointless bridges are now frequently employed, thus eliminating potential problems and maintenance of the structure at the expansion joints while decreasing the vulnerability of the structure to potential damage from natural hazards. Fatigue-resistant design details increase the capacity of a structure to service multiple cycles of heavy loads.

Better information has also been a direct factor in reducing the deficiencies in the bridge network. With periodic inspection and associated recording, bridge managers and engineers can now focus attention on structures with more critical problems. Trends show that the bridge engineering community is meeting the challenge of preserving the highway bridge network. However, as the inventory continues to age, additional demands will be placed on bridge engineers and managers. In particular, the large volume of structures built during the Interstate construction era will require increasing maintenance, major rehabilitation, and in some cases replacement. Given these projected needs and anticipated static budgets, further progress in the removal of deficiencies is in question.

Bridge management systems, including those using software such as Pontis and BRIDGIT, have been developed to optimize actions and associated funds expended within the bridge network. These systems are introducing new approaches to management of the nation's highway bridges. Component-level inspection (i.e., deck, superstructure, and substructure) is being replaced by detailed element-level inspection (e.g., girders, bearings, joints, piers), thus enabling more detailed modeling of the structure and associated deterioration. These new bridge management systems allow decision makers to consider future conditions and future demands on individual structures and the network of struc-

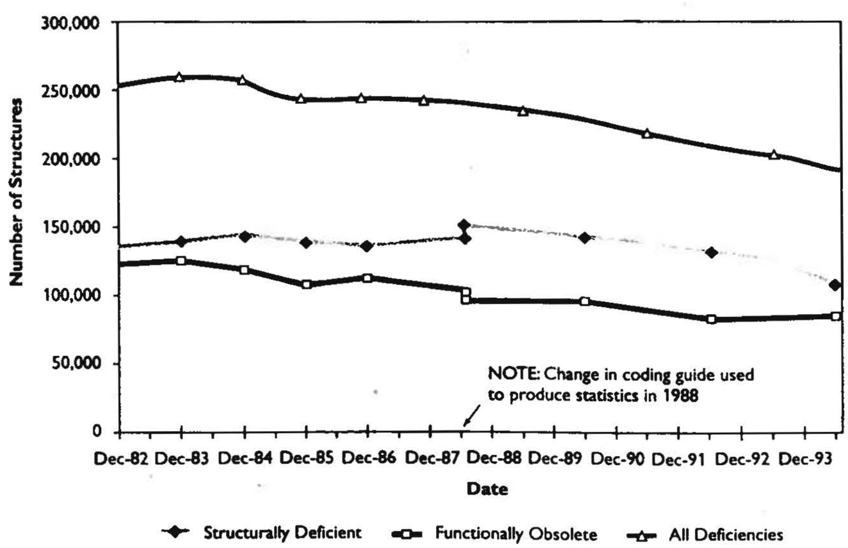


FIGURE 4 Deficiency trends.

A bridge is to a road what a diamond is to a ring.

Joseph Gies in *Bridges and Men*

tures when allocating available budgets. Optimization is performed for maintenance, repair, and rehabilitative preservation efforts in conjunction with functional improvements. Long-term strategies are developed over a 10- to 20-year planning horizon. Bridge management systems have been well received by state highway departments, the vast majority of which are either implementing or planning for such systems.

New technologies and structural materials are continually being developed through research and are frequently implemented. A noteworthy example is the application of composite materials for bridge column and pier repair, rehabilitation, and seismic retrofit. Seismic retrofitting techniques routinely employ composite material column-wrapping techniques to strengthen vulnerable columns, thus reducing the risk of damage and enhancing the safety of the traveling public.

High-performance concrete, high-performance steel, aluminum, and composite fiber reinforced polymer materials have been developed and are being utilized within the bridge design and construction community through pilot projects in many states. These materials promise increased longevity with decreased maintenance requirements and therefore lower life-cycle costs. In many instances, lower construction costs also result from the use of these new materials and designs.

New inspection techniques incorporating automated data collection and maintenance in conjunction with nondestructive testing and evaluation have been developed as well. For example, visual inspection methods do not permit the examination of deck conditions in lieu of removing an asphalt overlay system. Radar and infrared systems have been developed to isolate bridge deck conditions for structures with overlays, thereby enabling the use of quantified bridge condition information for the evaluation of structural performance and assignment of maintenance actions. Research is also being performed to integrate these nondestructive testing and evaluation technologies within the bridge management system decision-making process. With the integration of nondestructive evaluation into bridge management systems, the subjectivity associated with current visual inspection techniques will be eliminated, and decisions will be made on the basis of quantified condition information.

Summary and Conclusions

Bridge safety has significantly improved as a result of biennial bridge inspections by bridge owners. Since 1971 important data have been collected through these inspections, data that are now used to identify bridge vulnerabilities, such as where fatigue problems and material deterioration and degradation occur, and which bridge details cause ancillary problems (e.g., with expansion joints and bearings). Design countermeasures have been developed to improve bridge durability. For example, structural detailing has been modified; the use of expansion joints has been reduced; stable, more maintenance-free bearings have been developed; and flood and scour protection systems have been devised. New protective systems, including coatings (paints), concrete grouts, and barriers to reduce salt infiltration, have been developed and are now in use. Alternative deicing chemicals have been developed, thus reducing bridge deck deterioration caused by salting.

Stronger, more durable materials—concrete, steel, and laminated composite timber—are now being employed in bridge construction and rehabilitation. New methods of foundation design and construction, coupled with the use of more effective ground-modification technologies, reduce adverse bridge movement. On the horizon, a new breed of space-age structural materials that are lighter, stronger, and much more durable, coupled with the advent of nontraditional designs, gives hope for nearly maintenance-free bridges in the next millennium.

The bottom line is that the U.S. highway bridge network is one of the safest in the world. Failures in the 1960s, and occasional failures since then, have reminded the bridge engineering community of the need to be vigilant with respect to constantly evaluating the condition of the nation's bridges and improving the way these valuable assets are managed. The use of comprehensive condition data, the application of new technologies, and the ability to project future conditions and needs are all part of an inventory asset management approach that is now under development. When fully implemented, this approach will incorporate the use of higher technology while optimizing the application of financial resources to provide a safe, durable, and efficient highway system.

Reference

1. Slater, R. E. *Public Roads Magazine*. Winter 1996.

New East Bay Segment of the San Francisco-Oakland Bay Bridge - 59A0040

Organization Chart, Phase I

Caltrans District 59

Contract Manager
Ade Akinsanyna, P.E.

Project Manager
Brian Maroney, Ph.D., P.E.

Project Administrator
Mark Swatta, P.E.

Project Manager
Allen Ely, P.E.

Bridge Design Manager
Rafael Manzanarez, P.E.

Technical Supervisors
Man-Chung Tang, P.E.
Joseph Penzien, P.E.
Chuck Seim, P.E.
Greg Fenves, P.E.
Helmuth Krawinkler, P.E.

SUSPENSION BRIDGE
Herbert Rothman, S.E.
Team Project Engineer

SUSPENSION & SKYWAY BRIDGE
Donald MacDonald
Bridge Architect
Howard Brandston
Lighting Designer

CABLE-STAYED BRIDGE
David Goodyear, S.E.
Team Project Engineer

CABLE-STAYED & SKYWAY BRIDGE
Thomas Piotrowski
Bridge Architect
David Mintz
Lighting Designer

SKYWAY BRIDGE
Karen Cormier, P.E.
Team Project Engineer

ANALYSIS SUPPORT
Tim Ingham, S.E.
Team Project Engineer

ANCILLARY STRUCTURES
Jal Birdy, P.E.
Team Project Engineer

DESIGN SUPPORT TEAM
Kim Prishtina, P.E.
Project Engineer

Agenda Item 2

T.Y.LIN INTERNATIONAL
MOFFATT & NICHOL ENGINEERS
a joint venture

METROPOLITAN
TRANSPORTATION
COMMISSION

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Memorandum

TO: Bay Bridge Design Task Force

DATE: March 27, 1998

FR: Steve Heminger

RE: Legislative Update

Three bills have been introduced in the 1998 session of the State Legislature that have some bearing on the work of the Bay Bridge Design Task Force. They are briefly summarized below for your information.

- AB 1846 (Perata) would prohibit Caltrans from using toll revenues or State Highway Account funds to demolish the ramps connecting the Transbay Transit Terminal in San Francisco to the Bay Bridge. The bill is set for hearing in the Assembly Transportation Committee on March 30. Caltrans' preferred retrofit design for the Transbay Terminal ramps is to demolish the east ramp and to retrofit the west ramp and convert it to two-way bus operations for AC Transit. MTC has retained a traffic engineering consultant to examine the impact of Caltrans' ramp proposal on AC Transit operations and bus storage. The Task Force will receive a report on this consultant study at your next meeting.

- AB 2038 (Migden) would add a fourth item to the list of eligible "amenities" on the new Bay Bridge for which MTC can extend the $1 seismic retrofit toll surcharge for up to two years: bicycle and pedestrian access on the existing west span of the Bay Bridge. Under current law, there are three eligible amenities for the toll surcharge extension: a cable-supported new eastern span, relocation or replacement of the Transbay Terminal, and bicycle/pedestrian access on the new eastern span. AB 2038 also is set for hearing in the Assembly Transportation Committee on March 30.

- SB 1684 (Rainey) would set forth legislative findings relating to seismic retrofit and the contracting out of seismic retrofit projects, and would urge Caltrans and the Business, Transportation and Housing Agency to continue to expedite the delivery of seismic retrofit projects with the use of private consultants. SB 1684 is set for hearing in the Senate Transportation Committee on April 21.

METROPOLITAN
TRANSPORTATION
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Memorandum

TO: Bay Bridge Design Task Force

DATE: March 27, 1998

FR: Steve Heminger

RE: <u>Report on process of naming bridges</u>

In connection with the new eastern span of the San Francisco-Oakland Bay Bridge, Chairperson Mary King asked for a report on how bridges are named in California.

Highways and bridges in the state are named either through general usage or by legislative action. The San Francisco-Oakland Bay Bridge is generally known as the Bay Bridge. Some time ago, there was an attempt to name the bridge after James "Sunny Jim" Rolph, a former mayor of San Francisco and Governor of California who died in office as governor in 1934. However, the naming of the bridge after Rolph was never made official by act of the Legislature.

To secure approval by the Legislature, an Assembly or Senate concurrent resolution must be approved by both houses. The signature of the Governor is not required. Thereafter, Caltrans policy requires the sponsors of the bridge or highway naming to raise private funds for at least two roadside signs, one in each traffic direction. According to Caltrans, the cost for the two signs ranges from $800 to $1,200, depending on the length of the name inscribed on the signs.

Bay Bridge Design Selection Schedule
July 1997 to June 1998 (Revised)

Organization	Date	Action
MTC	July 30, 1997 (Wednesday)	1. Endorses Engineering and Design Advisory Panel (EDAP) recommendations 2. Selects northern adjacent alignment[1]
Caltrans	August-December 1997	Design teams contract selection process[2]
Caltrans	January 1998	Award of design contract
Caltrans and Design Teams[3]	January-June 1998	1. 30% design of a cable-stay/viaduct bridge 2. 30% design of a self-anchored suspension/viaduct bridge 3. Cost estimates for 1 and 2
EDAP Chair and Vice-Chair[4]	January 26, 1998 (Monday)	Explanation of EDAP recommendations to design teams
Bay Bridge Design Task Force (BBDTF)	February 11, 1998 (Wednesday)	Introduction of design teams; continued discussion of bridge "amenities" with additional monthly meetings as necessary
Caltrans and Design Teams[5]	March 2, 1998 (Monday)	Review of alternative design approaches with EDAP
Caltrans and Design Teams[6]	May 18, 1998 (Monday)	Presentation of designs and cost estimates to EDAP
EDAP	May 29, 1998 (Friday)	Formulate recommendation for BBDTF
BBDTF	June 10, 1998 (Wednesday)	Public Hearing to review design alternatives and EDAP recommendation
Bay Conservation and Development Commission (BCDC)	June 18, 1998 (Thursday)	Hearing and vote on policy issues of concern to BCDC
BBDTF	June 22, 1998 (Monday)	1. Review design, cost and EDAP recommendation 2. Prepare recommendation to MTC
MTC	June 24, 1998 (Wednesday)	Adopt recommendation to Caltrans on bridge design and "amenities", and act on toll surcharge extension

See footnotes on other side.

Bay Bridge Design Selection Schedule
July 1997 to June 1998 (Revised)

Footnotes

[1] Based on Caltrans assurance that a lifeline bridge can be constructed on the northern adjacent alignment, that fewer land use conflicts exist on the northern alignment, that vistas and "gateway to Oakland" are enhanced on the northern alignment and that more flexibility is available to design and build a cable supported span in the northern rather than the southern alignment.

[2] Based on a design team selection process of five months including a review of consultant selection criteria and scope of work by staff of MTC, BCDC and the Chair and Vice Chair of EDAP. Initial Caltrans estimate of three-month selection process was exceeded due to potential litigation by Caltrans engineers union.

[3] Based on the following assumptions:

a) two design teams will be selected, one to design the best cable stay/viaduct combined structure, the other the best self-anchored suspension/viaduct combination
b) all designs will be carried to an approximate 30% level with early reviews by a reconstituted EDAP
c) Caltrans is responsible for the "base case" viaduct.

[4] At this stage EDAP will have been restructured to eliminate members of the selected design teams. The standing of the restructured EDAP as advisor to Caltrans, BCDC and MTC is to be reinforced in this early dialogue between the chair and vice-chair and the design teams. The chair and vice-chair will represent EDAP in the early development of design options by the design teams.

[5] This is intended to be the milestone where design alternatives are presented by the design team and where there remains sufficient flexibility for substantial revision if EDAP is not satisfied with the design direction.

[6] The approximate 30% designs together with baseline and signature bridge estimates are to be presented for final review by EDAP.

Bay Bridge Design Task Force

April 8, 1998 - 1:00 p.m.

Public Sign-in Sheet

NAME	REPRESENTING	ADDRESS
		510-336-9865
1. Jerry Grace		4511 Mattis Ct.
510-336-9865		Oakland, CA. 94610
2. Ken [illegible]	PBQ&D	
Steve Noack	PBQ&D	
3. Nita [illegible]	BART	800 Madison 94607
4. Ade Akinsanya	Caltrans	
5. Victoria Eisen	ABAG	PO Box 2050 Oakland 94604
6. Bob Piper	Sierra Club	PO Box 14701 Berkeley 94712
7. Shanna O'Hare	City of Oakland - PWA	
	1333 Broadway #840 Oakland 94612	
8. Larry Rowland	RMC Lonestar	Box 5252
		Pleasanton Ca
9. Pamela Markmann	self - Berkeley citizen	1428 Milvia, Be 94709
10. Joe Carroll	SF Bicycle Coalition	4034 MLK Jr Way #3
		Oakland, CA 94609

Bay Bridge Design Task Force

April 8, 1998 - 1:00 p.m.

Public Sign-in Sheet

NAME	REPRESENTING	ADDRESS
1. Rube Warren	BART	200 Madison Oakland 94610
2. RICK WIEDERHORN	PORT OF OAKLAND	530 WATER ST, OAK 94607
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

PRESS
Bay Bridge Design Task Force

April 8, 1998 - 1:00 p.m.

NAME	REPRESENTING
1. Evelyn Strauss	KQED Radio
2. Carolyn McMillan	Contra Costa Times
3. [illegible]	[illegible]
4. Norman Rolfe	SF Tomorrow
5. Derek Shuman	
6. RICHARD TRAINOR	SF MAGAZINE/SACTO NEWS + RVW.
7.	
8.	
9.	
10.	

Dion Louise Aroner ASSEMBLYWOMAN, FOURTEENTH DISTRICT
CALIFORNIA LEGISLATURE, STATE CAPITOL, SACRAMENTO, CA 95814 (916) 445-7554 FAX (916) 445-6434

CHAIR, ASSEMBLY HUMAN SERVICES
COMMITTEES:
JUDICIARY
REVENUE & TAXATION
SELECT COMMITTEES:
CALIFORNIA WOMEN
COASTAL PROTECTION

May 13, 1998

Chairwoman Mary V. King and Members
Bay Bridge Design Task Force
c/o Metropolitan Transportation Commission
101-Eighth Street
Oakland, California 94607

Re: Transbay Terminal

Dear Chairwoman King:

It has come to our attention that at today's meeting of the Bay Bridge Design Task Force, the MTC staff will make a preliminary recommendation for action related to the Transbay Terminal.

We were quite distressed by the recommendation made by the MTC staff to extend the toll charge for the purpose of relocation or replacement of the Transbay Terminal. It is not clear what the recommendation really is, except to say that relocation and replacement continue to be the preferred alternative by staff. We are greatly disappointed that the issue of relocation of the terminal and the removal of the ramps is still on the table, when it is clear that the public does not support these options.

Our East Bay constituents pay well over half of all bridge tolls. We do not believe it is likely that paying an increased toll for two years for an unnecessary project that is not in the interest of East Bay residents will be received with favor. They deserve to know how the proposed extra funds will be spent before the increase is approved, and not after.

We believe the Transbay Terminal is a vital regional resource. In the past year, ridership on Transbay buses has increased more than forty percent. As travel across the Bay grows in the future, we expect to see continued growth in bus ridership.

The memorandum from staff of the Metropolitan Transportation Commission (6 May) to the Bay Bridge Design Task Force on relocation of the Terminal and demolition of the vital bus ramp is discomforting. There appears to be no analysis comparing retention of the existing, upgraded facility with a costly new facility at a location farther from downtown. Additionally, the analysis of the long-term costs and benefits associated with demolishing the bus ramp for a temporary automobile ramp appears inadequate at best.

MTC has shown leadership in other transportation areas in the past. We urge MTC to show similar leadership today in the area of bus mass transit across the Bay Bridge. It is too important a service for a regional leadership vacuum to exist now that the state has devolved authority to MTC.

Sincerely,

Dion S. Aroner
Assemblymember Dion Louise Aroner

Assemblymember Don Perata

Assemblymember Liz Figueroa

Assemblymember Michael Sweeney

Tom Torlakson
Assemblymember Tom Torlakson

THE PEOPLE ON THE BUS

May 13, 1998

Chair Mary King and Members
Bay Bridge Design Task Force
Metropolitan Transportation Commission
Oakland, California

Re: Transbay Terminal and Ramps

Dear Chair King and Members:

The following remarks are made on behalf of *The People on the Bus*, of which I am a member, and also represent my perspective as a professional architect.

When I mention the Transbay Terminal, I am referring to both the building and the ramps which are an integral part of its whole streamlined accommodation for the seamless movement of people and vehicles. Two legs are needed to run a smooth operation, not one leg and a crutch.

The site of the Transbay Terminal would be a perfect location for an intermodal station connecting both rail and bus systems, a new 21st century grand gateway union station at the heart of the region. But, this does not seem to be an option in the near future, since San Francisco seems content with a system of cobbled together connections. Therefore, there is absolutely no transportation reason to use transportation funds to demolish it and replace it with a less efficient structure at a less convenient location with decreased capacity.

The importance of transbay bus service is illustrated by the fact that BART's headway through its Transbay Tube is limited during commute hours by the time it takes the disproportionate number of riders to embark or disembark at the Embarcadero and Montgomery stations. Only buses have the flexibility to expand service quickly and alleviate congestion in the Bay Bridge corridor.

This Terminal was built in an era which considered an efficient public transportation system to be the life blood of commerce and trade. They hired the best architects to design stations that expressed civic pride in public transportation. And they designed

PO Box 190310
Rincon Station
San Francisco, CA 94119

The People on the Bus

and constructed them to last not just one or two generations but to serve needs in the distant future. It even withstood the '89 earthquake without damage.

Attached is a copy of an article about the Transbay Terminal published in the September/October issue of the San Francisco Heritage Newsletter. A Caltrans survey determined that is was eligible for the National Register of Historic Places. I would not necessarily characterize myself as a preservationist, but if you have something that is functioning as well as the Transbay Terminal, and you can't build something at a more convenient location that will function more efficiently, it makes sense to keep it and upgrade it. The amount of land fill alone that its demolition would create should make one hesitate and op for recycling.

For a fraction of the cost of building a new terminal, it could be upgraded to meet current code requirements. And the original patina of its exterior and the delight of its interior space could be restored. In fact, in the short term, even a few million dollars worth of paint and good lighting could enormously improve both the interior public spaces and transform the black holes over Fremont and First Street into inviting gateway arcades. In fact, with the economy now heating up proposals for development of the blighted area to the south of the terminal, there could soon be a reason to walk to the south of the terminal so such an arcade could attract retail uses.

We have a specific proposal. Instead of quoting from a 1992 study, we urge you to take a fresh look at this terminal, and current and future needs. A 1991 study of ferries claimed they were not economically viable, but MTC has recognized times have changed and ferries are now being seriously restudied. Similarly, we urge you to create a Task Force consisting of agency representatives and citizen users to study the upgrade and enhancement of this facility, including the possibility of reconfiguring the interior of the Terminal to create viable commercial space. We need to take advantage of the opportunity offered for buses on the new I-80 HOV lanes and the future capacity for rail on the new bridge. Is there any other viable way to reduce congestion on the bay bridge?

Sincerely yours,
The People on the Bus

Joyce Roy

Joyce Roy

POBBBDTF.LTR

servation Notes

ntinued from page 4

Weeks and Day designed the two-story Renaissance Revival brick building and the flanking single-story north and south wings. Demolition of the south wing in 1970 made way for a newer building, not connected with the historic structure.

On September 17, the Landmarks Board adopted a site boundary that takes in the entire northern portion of the property, including open space, to a line about 40 feet south of the historic building.

Acting on a second nomination, the Landmarks Board voted to designated historic Engine House No. 31, at 1088 Green Street. Built in 1908 as part of the City's post-earthquake reconstruction under city architect Newton J. Tharp, the Russian Hill fire station served until 1952, when the fire department declared it surplus.

Mrs. Louise M. Davies acquired it in 1958 and converted it to a pied-a-terre, retaining the building's historic features. In 1978, she deeded it to the National Trust, which recently sold it. to the Saint Andrew's Society, a Scots benevolent society incorporated in 1863.

As a condition of the sale, the Society granted the Trust a preservation easement and agreed to seek landmark designation. The Tudor Revival fire house has been on the National Register since 1987.

1088 Green Street

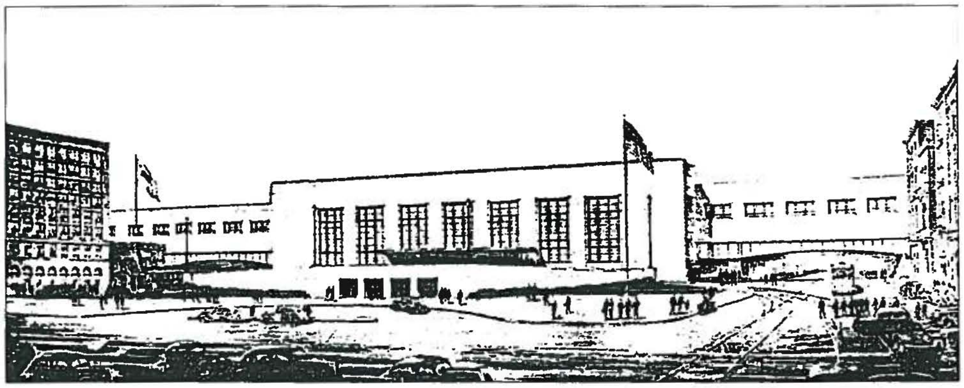
TRANSBAY TERMINAL

The Planning Department has issued a revised notice that an environmental impact report will be required for the Transbay Redevelopment Plan, taking notice of the significance of the Transbay Terminal.

Among the plan area's historic resources, the Transbay Terminal appears to be the poor stepchild. Nearly every newspaper account of the redevelopment proposal assumes the demolition of the 1939 transit center, even though a Caltrans survey several years ago determined that the building is eligible for the National Register of Historic Places.

Allan Temko has described the Transbay Terminal as "one of the best examples of 1930s moderne in downtown San Francisco," and noted that historically it belongs with the Bay Bridge, although completed three years after it. The reinforced concrete structure is faced with California granite in an austere moderne styling whose only ornament is aluminum trim on the two-story windows of the building's central section.

The architects were Timothy Pflueger, Arthur Brown, Jr. and John J. Donovan. *Architect and Engineer* (January 1939) noted, "Convenience to passengers was the governing motive in the design of the terminal," and it continues to function well nearly 60 years after it opened. The only substantial change has been removal of the tracks that carried commuter trains from the East Bay. Buses now use the concrete train viaduct directly to and from the Bay Bridge, making a continuous loop through the terminal, east to west, free from rush hour traffic on city streets.



North elevation, Transbay Terminal,* Architect and Engineer, *September 1937

The plan is set up to disperse foot traffic quickly and efficiently. Multiple ramps and stairways lead to the loading platforms. Seventeen entrances (by the count in *Building News*, July 1939) allow access to and from curb-side bus service and the "F" streetcar line, which serves the second level entrance via a ramp.

The ground floor of the tripartite structure's central pavilion houses a large waiting room, and there are spaces for a variety of concessions here and on the second level. The west wing has a parking garage.

Interior materials are practical; terra cotta tile walls and terrazzo floors seem in good condition after years of wear. Skylights and large windows admit daylight to the platform area.

The terminal could stand refurbishing, but statements about its demise are greatly exaggerated. The EIR will have to consider alternatives to demolition, including retaining and upgrading the terminal for its current use or for adaptive use. If any federal funds come into play, demolition will have to undergo 106 Review.

OFFICE OF THE MAYOR
SAN FRANCISCO

WILLIE LEWIS BROWN, JR.

May 13, 1998

The Honorable Mary V. King
Chair, MTC Bay Bridge Design Task Force
101 Eighth Street
Oakland, CA 94607-4700

Dear Supervisor King,

I am writing at this time in regard to your pending decision on funding of Bay Bridge project elements, and specifically, to clarify San Francisco's position and intentions with respect to a very important element, the Transbay Transit Terminal replacement.

As you may recall, in late 1997, San Francisco's on-going environmental work on a replacement terminal and the future of land use and development in the Transbay area were suspended due to my concerns about the level of support for the proposed new terminal. Although formally endorsed by the San Francisco Board of Supervisors, the lack of clear support on the part of Caltrans and MTC for San Francisco's work on this important regional transportation project led me to question the value of our endeavor.

Recently, both MTC and Caltrans officials have assured me that they support San Francisco's policy to replace the oversized, unfriendly, and unsound Transbay Transit Terminal with a modern, efficient facility which will welcome increasing numbers of riders for decades to come. Given that assurance, San Francisco has decided to move forward once again with this project and will reinitiate the planning and environmental efforts to build a new terminal at the selected site of Howard and Main and Beale Streets. We will continue to work closely with all responsible agencies and parties to bring this important project to fruition.

Solid land use and transportation planning considerations led San Francisco, working for more than a year through an inter-agency effort, to site the new terminal at the selected location. One of the most important of these considerations is the ability to minimize the impact of building a new terminal on AC Transit's daily operations. Construction of a new terminal at the Howard Street site, coupled with Caltrans' plans to modify the existing terminal for interim operations, will mean that AC Transit's operations will continue to provide quality service to and from San Francisco with little or no operational difficulties. When the new terminal is completed and is linked to the new Terminal Separator Replacement and Bay Bridge via exclusive bus lanes, AC Transit will be able to relocate its operations from the dreary environment of the existing terminal to a bright and hospitable new terminal.

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CE OF THE MAYOR
SAN FRANCISCO

WILLIE LEWIS BROWN, JR.

As you know, the Transbay Transit Terminal replacement is on the list of Bay Bridge project elements to be funded with surplus toll revenue. San Francisco needs the assistance and support of your Task Force to assure that a substantial commitment of funds for a new terminal are provided. The City, working closely with AC Transit, MTC, Caltrans, and other regional transit providers, will now continue to move forward to develop a financing plan, appropriate environmental documentation, and an operating proposal for the new terminal.

With your help, I am confident that we can replace the Transbay Transit Terminal with a new facility which the region will point to with pride. Those who ride transit across the Bay, and to and from other regional locations, certainly deserve a better terminal. I am prepared to work with you and other East Bay leaders to make a new terminal a reality. Thank you for your regional leadership on the critical Bay Bridge needs and for your consideration of San Francisco's views regarding the Transbay Transit Terminal element.

Sincerely,

Willie L. Brown, Jr.
Mayor

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May 12, 1998

Supervisor Mary King
Chairperson
Metropolitan Transportation Commission
Bay Bridge Design Task Force
101 Eighth Street
Oakland, CA 94607-4700

Dear Supervisor King:

AC Transit has been working with MTC and Caltrans staff to assess the impacts of the decision by Caltrans to remove the Transbay Terminal eastern ramp. All three agencies, plus the City and County of San Francisco and the Golden Gate Bridge Highway and Transportation District, convened a working group to further explore issues associated with the Caltrans decision. The working group retained the services of a consultant to analyze the continued viability of AC Transit operations under the Caltrans plan.

We have had extensive discussions with MTC staff and the working group regarding the findings of the consultant analysis. The May 6, 1998 MTC staff report to your task force summarizes some of the issues associated with the seismic project and also the status of the terminal building.

It is our understanding that a final version of the MTC staff report was circulated to members of the Bridge Design Task Force. Although AC Transit was given an opportunity to review the MTC staff report before it was distributed, we do not believe that the final report addresses all of the concerns voiced by AC Transit, East Bay legislators and elected officials, or Transbay bus riders.

In particular, the following issues are still outstanding regarding the Caltrans-proposed two way western ramp operation:

- The traffic management plan (TMP) for the retrofit of the west span of the Bay Bridge and the I-80 freeway could call for additional transbay bus service to mitigate the traffic impacts of that project. The Caltrans proposal would not allow needed additional bus service.

- The proposal would only work if **all** of the conditions specified in the MTC staff report are met, and even then, there is no guarantee that the present day level of reliability (99% on time departures) would be achieved. If all the conditions specified in the MTC staff report are not met the plan is likely to fail.

- The Caltrans proposed operation is fragile, at best, and would require additional personnel to facilitate bus movements. Any traffic disruption on the Bay Bridge could cause the entire operation to collapse.

- The findings of the consultant's analysis indicate that the Caltrans proposal might work as an interim solution, possibly accommodating current bus operations; the viability of this proposal in the long term has not been confirmed.

- There would be a significant increase in annual operating costs, of which the financial responsibility for those costs has not been identified. The consultant analysis indicated approximately $1 million per year in additional operating costs to store buses in the East Bay which are currently parked on the terminal ramps between the morning and afternoon peaks. The cost of additional staff to facilitate bus operations through the facility proposed by Caltrans has not yet been identified, but would be in addition to the $1 million per year.

- It has not been either financially or operationally demonstrated that the removal of the eastern ramp is the best option for the seismic retrofit project, nor the best solution for the region. There is no mention of the already-completed Caltrans analysis to renovate the existing terminal and ramps. For example, it has not been demonstrated that shoring up the eastern ramp from underneath should not have been brought forward as an option. The ramp renovation alone was estimated at $9 million.

- The proposal has yet to be fully analyzed to determine if it is actually operational. The only component that has been field tested is the radius of the proposed turn around "bulb" on the east end of the terminal.

- The MTC staff report does not fully acknowledge the limited degree to which the Caltrans proposal could accommodate AC Transit's expanded Transbay operations which are currently being implemented.

- With further implementation of the Transbay service enhancements, buses could back up onto the Fremont Street automobile ramp while awaiting access to the terminal.

- The eastern ramp issue is not a short term one. Instead, this issue needs to be examined in the context of a one-time capital cost to renovate the ramp versus the additional annual operating costs that would be encumbered over a much longer period of time.

- A cost-benefit analysis has not yet been conducted to assess the cost of renovation versus the additional operating costs over a long term period.

- The recommendation to remove a high-volume bus ramp which could accommodate up to 120 buses/hour and 6,000 passengers as a temporary step in an 8-10 year retrofit project to permit two added lanes for single occupant vehicles entering already congested San Francisco streets is perverse.

The findings of the consultant are documented in a draft report. That report identifies the serious issues that remain to be resolved concerning the Caltrans eastern ramp proposal. These issues will be the subject of further discussions with the working group, and between the East Bay and the City and County of San Francisco. No decision should be made concerning that ramp until a full analysis of other options is made.

We remain concerned about the viability of our expanding Transbay bus operations if the eastern ramp is removed. Once that ramp is removed, the impact on these operations could be severe. AC Transit requests that all options for addressing the seismic upgrade of both the eastern and western ramps be fully explored before a decision is made. It is our desire to continue to work in a cooperative manner with MTC, Caltrans, and the City and County of San Francisco to find a solution to these issues.

Sincerely,

M. Williams

Matt Williams
President
AC Transit Board of Directors

cc: AC Transit Board of Directors

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Assembly
California Legislature

KEVIN SHELLEY
MAJORITY FLOOR LEADER
ASSEMBLYMEMBER, 12TH DISTRICT

COMMITTEES

Appropriations
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Public Employees, Retirement and Social Security

Select Committee on the California Middle Class

Select Committee on California's Women

May 4, 1998

The Honorable Mary King, Chair
Bay Bridge Design Task Force
Metropolitan Transportation Commission
101 Eight Street
Oakland, CA 94607-4700

Dear Ms. King, Mary

I am writing to urge you to support a design for the Eastern Span of the Bay Bridge that supports not only light rail, but also regular passenger train service.

Projects to increase intercity rail service are on the increase. The plan to increase service on the Amtrak Capitol line is just one example. At the same time, existing mass transit links across the Bay, such as BART, are nearing capacity.

The building of a new span for the Bay Bridge presents an opportunity to put in place the infrastructure to meet the Bay Area's future transportation needs. Intercity passenger rail promises to ease traffic congestion, improve air quality, and generally enhance the economy of the Bay Area.

I appreciate your support for intercity rail across the Bay Bridge.

Sincerely,

Kevin

Kevin Shelley

KS:ms

cc: Dave Massen, Sustainable San Francisco